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PARTICULARS OF LAKE SUPERIOR ORE DOCKS.

Duluth, Minn., April 30.—Following is a condensation of a statement made up by Chief Engineer R. Angst of the Duluth & Iron Range Railway, showing the iron ore shipping docks on the American side of the upper lakes, as they will be when present construction is completed:

PARTICULARS OF LAKE SUPERIOR ORE SHIPPING DOCKS.

Railway and Location.	Dock designation.	No. of pockets.	Storage capacity, gross tons.	Height, water to bottom of pocket.	Height, water to track deck.	Width of dock.	Length in feet.	Angle of pocket floor.
C. & N. W., Escanaba.....	1	184	24,104	28' 10"	48' 6"	36' 0"	1104	39° 30'
" " " " " " " " " " " "	2	226	30,284	31' 2"	52' 8"	36' 0"	1356	45° 0'
" " " " " " " " " " " "	3	250	32,750	36' 6"	59' 8"	36' 0"	1500	45° 0'
" " " " " " " " " " " "	4	232	43,152	28' 6"	53' 2"	36' 0"	1392	40° 0'
" " " " " " " " " " " "	5	234	36,036	32' 10"	54' 0"	46' 8"	1404	39° 30'
" " " " " " " " " " " "	1	234	25,740	36' 6"	57' 8"	46' 0"	1404	42° 0'
D. & I. R., Two Harbors.....	1	202	40,400	35' 5"	59' 6"	49' 0"	1388	38° 42'
" " " " " " " " " " " "	2	208	41,600	33' 5"	57' 6"	49' 0"	1280	38° 42'
" " " " " " " " " " " "	3	90	16,200	28' 10"	52' 0"	49' 0"	572	38° 42'
" " " " " " " " " " " "	4	168	36,960	37' 0"	62' 0"	49' 0"	1112	38° 42'
" " " " " " " " " " " "	5	168	33,600	30' 0"	54' 6"	49' 0"	1112	38° 42'
D. M. & N., Duluth.....	1	384	57,600	30' 0"	53' 0"	2336	45° 0'
" " " " " " " " " " " "	2	384	69,120	32' 0"	57' 6"	2336	45° 0'
" " " " " " " " " " " "	3	192	40,320	40' 7"	67' 5"	59' 0"	1152	45° 0'
D. S. S. & A., Marquette.....	1	270	27,000	25' 0"	45' 0"	40' 0"	1700	39° 0'
" " " " " " " " " " " "	3	213	12,780	23' 0"	37' 0"	53' 0"	1200	39° 0'
" " " " " " " " " " " "	4	200	28,000	27' 9"	47' 3"	36' 8"	1200	39° 45'
L. S. & I., Marquette.....	1	200	36,000	30' 9"	54' 0"	50' 0"	1232	38° 40'
Great Northern, Superior.....	1	250	40,500	32' 0"	57' 0"	49' 0"	1525	45° 0'
" " " " " " " " " " " "	2	350	87,500	40' 0"	73' 0"	62' 8"	1500	45° 0'
M. St. P. & S. S. M., Gladstone..	1	120	15,000	26' 8"	47' 0"	37' 0"	768	40° 0'
Wis. Central, Ashland.....	1	314	40,000	31' 4"	54' 6"	36' 0"	1908	(Note.)
C. M. & St. P., Gladstone.....	1	240	50,400	40' 3"	66' 6"	52' 0"	1500	45° 0'

Note—The angles of pockets of the Wisconsin Central dock at Ashland vary, 234 of them having an angle of 42° 30' and the rest 8° 5' steeper. The angle of an ore pocket is the slope of the floor of the pocket towards the spout hole, and is usually steeper for soft, especially for Mesabi, ores than for hard ores.

These docks vary greatly in height, particularly in height from water to bottom of pocket. The constant increase in depth of water in the channels connecting the lakes, the like increase in the depth of ships for ore traffic, have necessitated the changing of dock structures and an entire revision in former models. Old No. 3 dock of the Duluth, South Shore & Atlantic road at Marquette is the most notable example of antiquated construction, with a height of 23 ft. to pocket, and 14-ft. pockets. It is not now in commission. The "Soo" road's dock at Gladstone is the lowest in use, less than 27 ft. to pockets and but 47 ft. to the deck. This dock can not handle the type of ore-carrying vessels that has come into vogue in the past eight or nine years. From it to the dock of the Great Northern at the head of Lake Superior, 40 ft. to the bottom of pockets and 73 ft. in extreme height to deck, marks a notable revolution in lake shipping interests.

These various docks show an aggregate storage capacity of 865,046 gross tons of ore at one time, and have an aggregate shipping capacity for about 26,000,000 tons in a customary lake season. To them should be added the Algoma Central Railway Co.'s dock at Michipicoten, Canada, which, though it has no storage capacity, is able to ship from 600,000 to 800,000 tons in a season, depending upon railway service.

GOVERNMENT SYSTEM OF WIRELESS TELEGRAPHY.

It has been several times noted in these columns that departments of the United States government interested in wireless telegraphy have not taken up specially any one system but have been making tests of various systems and have been experimenting on their own account with a view to securing the best system for the different government services. Now it is announced that experiments with what is known as the Fessenden-Moore system at Roanoke island, N. C., where the United States weather bureau has been conducting a station for some time past in connection with another station at Cape Hatteras, have been highly successful; that the possibilities are greater than those of any other system; that in no point is it like the Marconi system, and that it will undoubtedly be adopted by the government. Tests at Roanoke island during the past week have been witnessed by Gen. Greely, chief of the army signal service and by Lieuts. A. M. Beecher and J. M. Hudgins of the navy bureau of equipment, as well as Supt. O. H. Tittman of the coast and geodetic survey. A correspondent writing from Wiers Point, Roanoke island, says that unless the weather bureau is very much mistaken the possibilities of the system are tremendous, and the naval experts who have witnessed tests, and who have made a study of these questions, do not seem to think that the weather bureau's claims are too high. The system has been practically completed for some little time, and messages have been flashing back and forth between Wier's Point and Hatteras inlet several times a day for two weeks.

The system is the invention of Prof. R. A. Fessenden, who has been at work on it for two years past under the direction of Chief Willis L. Moore of the weather bureau. The principal feature of the system, that which differentiates it from the other systems, is in the receiving process. Heretofore it has been believed that messages by wireless telegraphy, no matter what the system, could not be received without a coherer. Prof. Fessenden conceived the idea that a receiving instrument could be constructed vastly more sensitive than the coherer, and that if this could be done every obstacle in the way of making wireless telegraphy completely practical for business purposes would be removed. This instru-

ment, the successor of the coherer, he calls the "wave detector." The following statement regarding the system is from Prof. Fessenden:

"This work was taken up about two years ago at the instance of Prof. Moore of the weather bureau, who saw the advantage which a practical system of wireless telegraphy would have for use in distributing weather bureau signals and in obtaining data for making forecasts. At present they can only obtain meteorological data from the land, and predictions based on these are frequently vitiated by the condition of affairs on the Atlantic. It was believed by Prof. Moore that if we had means whereby the state of the barometer, etc., out on the ocean could be sent in, both on the Atlantic and Pacific oceans, much more accurate forecasts could be made. I was asked to undertake this work, and we went down to a point on the Potomac river and started operations. The first point that was taken up was the nature of the phenomena involved. We found that it was not due to Hertzian waves, but due to a new form of waves that had never before been investigated, a wave that did not travel outward in a straight line through space, but followed the surface of the conductor. We followed these waves up over hills and along level places and across land, and produced interference with them, until finally the behavior of this class of waves had been traced out with absolute certainty under every condition. We next traced the depth which these waves penetrated the surface of the earth or water, and found that the maximum penetration was about 1 ft. for sea water or 3 ft. for land. We next took up the question of measurement of energy radiated out by different forms of apparatus and measurement of the amount of energy required to work various forms of receivers. We next measured the losses in transmission and determined these, and were finally able to calculate about how much energy we would get at the receiving station with considerably more accuracy than a telegraph designer can tell how much energy he will have available at the end of his line. On actual tests our calculations were then checked up and found to be accurate for all distances between 30 yards and 75 miles.

"Having found the laws and perfected the generating apparatus, we next turned our attention to the receiver. We systematically took up the various properties of the matter, such as light, heat, friction, and worked out the best form of receivers which we could devise in each class. Of these we have selected three or four, and one of these is the one which was used in the tests before the signal service and the representatives of the navy department. This is by no means the most sensitive of our receivers, but it works well with about one five-hundredth of the energy required by the coherer, and it seemed to be the form which could be most rapidly developed. The work is by no means finished. We have also paid attention to selective methods and multiplexing methods. We have four or five methods, all of which have been successfully tested in practice, and do not anticipate any trouble in this direction. But there is a good deal more of detail work to be done before we will be through with the subject, the designing of the best form of switches, keys, automatic devices to prevent accidents to the apparatus, the best form of tuning devices, etc., but these are merely matters of experiment and will be finished just as soon as we can cover the grounds.

"As regards wireless telephony, it can be stated definitely that telephoning up to at least 200 miles is absolutely certain of accomplishment. We do not, however, intend taking up this work until we have finished our work on the wireless telegraphy, but we can definitely state that it is certain of accomplishment. The essential difference between my system and Marconi's is difficult to describe, because in no point are the two systems alike. Marconi uses an air transformer at the sending end and concentric cylinders and has his capacity arranged in a certain way. I use neither of the above, and my capacity is arranged in an entirely different way. At the receiving end Marconi uses an imperfect contact, that is a coherer. I use no imperfect contact, every contact used in my receiving apparatus being of solid metal, and there is no principle similar to that of the coherer involved, the method depending upon an entirely different physical law. Naturally, therefore, all the details of the receiving apparatus are entirely different."

UNITED STATES STEEL IMPROVEMENTS.

There is no official statement as yet regarding the distribution of the \$50,000,000 which the United States Steel Corporation is to spend for improvements, but rumors on that score are still rife in New York and Pittsburgh. A late dispatch from New York on the subject says:

Between \$10,000,000 and \$15,000,000 will be expended in increasing the facilities of the American Bridge Co. and the National Tube Co. Some \$7,000,000 or \$8,000,000 will be allotted to the American Steel & Wire Co. and the American Tin Plate Co. for the same purpose. No large amount will be received by the Carnegie Co., as its plants are modern and in a high state of efficiency. It is reported that the corporation proposes to spend from \$15,000,000 to \$20,000,000 in and about Pittsburgh if it receives assurance from the railroads reaching that center that they will provide increased transportation accommodations."

While there are ten private yards in Great Britain all engaged in building first-class warships, there are only ten yards in Germany, nine in France, and six in Russia, including the government establishments, while several of the British private yards could without difficulty duplicate their orders. Again, in France and Russia the cost of armored ships works out at £100 a ton, against £76 to £80 in Great Britain, while in Germany, where labor is cheap and the skill is of a high order, the cost is about £70.

Nine of the fleet of transports used by the army are soon to be sold at auction. These vessels are the Hancock, Relief, Lawton, Rosecrans, Meade, Sedgwick, Sumner, Egbert and McClellan. It is said their future value is depreciated by the fact that they cannot be given American registry.

WHERE ARE THE FREE SHIP ADVOCATES?

By A. R. Smith, New York.

The merger of the transatlantic lines under American control has completely unmasked the false pretences and shallow hypocrisy of free traders, both in the United States and in Great Britain. Ever since the civil war British newspapers have been telling us that we can only hope to build anew the American mercantile marine by purchasing ships where they can be most cheaply bought and giving them American registry. It was of no consequence that preceding the advent of Oliver Cromwell the policy of free ships had denuded the seas of British shipping; it was of no consequence that the rigorous protective policy adopted by Cromwell in 1651 tore the broom from the masthead of Dutch merchant shipping that had previously flaunted Dutch maritime supremacy in its passage through "the Narrow Seas," since known as the English channel; it was of no consequence that so long as British-built ships were dearer than foreign-built ships the free-ship policy knew no place upon British statutes; and it was of no consequence that with dearer built but protected ships the British gained and for two centuries held control of the world's carrying trade; these considerations were relegated to the rear and a new British policy was to be proclaimed to the world—that of free ships.

And now a syndicate of American capitalists has bought up a million tons or so of the cream of British steamships—an accomplishment that should have brought forth songs of joy and commendation from the mouth of every free trader in Great Britain and in the United States, and what do we find? The British press teems with agonizing and heart-rending wailings over the impending dethronement of British maritime supremacy; the evil propensities of the modern "Yankee trust" are depicted with pencil and pen, and the thralldom of the world is dolefully predicted; men of importance in British affairs have been interviewed and have expressed the direst apprehensions over the outlook for British shipping as a result of the American purchase of one-tenth of its ocean-going steam shipping; the government leaders in the British parliament have been catechised by perturbed members who insistently demand to be told what steps are being taken by the government of Great Britain to prevent this American octopus from purchasing British steamships; the cables groan with the weight of information as to what will be done by the British government to prevent American citizens from securing legal control of the ships for which they have paid good American cash into the willing hands of their former British owners; harrowing rumors are being put in circulation by British news agencies of the fell purpose of these devouring Americans to have the law repealed that has been upon our statutes since 1792, and which denies American registry to any but American-built vessels, so that these British-built steamships may be "Americanized;" and with shudders they predict that the end is not yet, that even the Cunard will fall a prey to the insatiable greed of this all-powerful American syndicate, and that the oceans will no more know the red ensign which has been the insignia of surpassing sea power for centuries!

And have we found commendatory words falling from the lips of American free traders? Do they look with unconcealed joy upon the million tons purchase of British shipping by an American syndicate? Do they herald to the world the fruition of their long-hoped-for creation of an "American" mercantile marine of British ships? Are they demanding that the congress of the United States shall at once give to this vast tonnage full American registry? Are they holding up to scorn the panic-stricken Britons? On the contrary, they, too, indulge in lamentations; they, too, picture the horrors of American acquirement of British tonnage in large blocks; they portentously predict dire results from the growing power of the all-absorbing "American trusts." That their dearest wish has been achieved, in that Americans have, at last, "bought their ships where they can be purchased cheapest," instead of being an epoch-making, shackle-breaking, free-trade accomplishment, is a fear-inspiring prelude to still worse "invasions" by all-powerful American syndicates!

Not yet has a free trade newspaper, either in the United States or abroad, so far as I have seen, eulogized Mr. J. P. Morgan and his associates for their record-breaking purchase of steamships "where they can be obtained cheapest." Why these reproachful looks, these tear-stained cheeks, these doleful free-trade countenances? Why has their joy been turned to sorrow? Why has the realization of their wildest and brightest free-trade dream been made the occasion for their most lugubrious utterances? Why? Only because their free-trade, free-ship arguments have been hypocritical; because they never dreamed and never desired that Americans should obtain a foothold upon the sea that might drop the red ensign below the horizon; because the most delusive of all of the theories in the Pandora box of free trade was free ships! Free ships to be successful, as a policy, mean the purchase of foreign-built ships. To what extent has Great Britain's vast shipping been built up with foreign-built ships? The very question suggests the hollowness of the free-ship delusion. Free ships have done nothing for Great Britain, the great bulk of whose ships have always been British-built. Free ships have accomplished little or nothing for other nations, none of which, excepting the United States, has denied national registry to foreign-built shipping.

Mr. Morgan may, indeed, save the British nation from going stark mad by stating that he desires nothing but British registry, British management, British officers and British seamen for his newly acquired steamships. That may be their salvation. He may restore to some degree of equanimity the agitated and distraught American free traders who, dreading the final consummation of their free-trade advocacy, have been at their wits' ends to know how to meet the distressing consequences of threatened American dominion upon the seas by stating for their relief that he contemplates no change of flag over his British steamship purchases. If they really believe that Mr. Morgan is sincere in holding on to British registry, British management, British officers and seamen, and cannot be swerved from such a determination, they may again grow bold and hedgingly demand that congress shall pass a free-ship bill, in order that these American purchases of foreign tonnage may be Americanized. But they are apt to be cautious. Should a free-ship act be passed and still Mr. Morgan and his associates refuse to take out American registers for their British-built steamships because they can run them cheaper under the British than under the American flag, they might be embarrassed by such a practical disclosure of the fallacy of an American free-ship law.

The humbug of the free-ship pretenders has been exposed, and a

fearful dread of dominant American sea power will probably put an end to its further serious agitation. Meanwhile, let us concentrate our gaze upon Great Britain, and watch for the method by which the leading free-trade nation, the very cradle of free ships, will, through its government, place obstacles in the way of the greatest of all free-trade achievements—free ships!

BRITISH SCARE OVER THE STEAMSHIP MERGER.

Probably the most interesting report of the effect of the steamship merger on the British public was from the London correspondent of the New York Sun, who wrote as follows:

"It is no exaggeration to say that the average Englishman regards the North Atlantic shipping merger as a national calamity of the first magnitude. He takes the most pessimistic view of the situation and sees the loss of supremacy of the British marine clearly foreshadowed. The easiest explanation, perhaps, is that England is periodically subject to a peculiar malady, a sort of metaphorical seasickness. These attacks are known as naval scares. They are sometimes spontaneous in their origin, but are occasionally induced artificially when the government seeks justification for bleeding the body politic more severely than usual, as for instance in the forthcoming budget. At such times John Bull fidgets himself into alarm verging upon despair over the supposed defects in his chief reliance for defence and the dangers to his proudest possessions—his mercantile marine. He is grieved and incensed over the present situation because he conceives that the attack has come from those whom he has counted as his friends. In a few days he will probably begin to realize that there is something absurd and ludicrous in his present attitude. It is simply silly in a country so intensely commercial as England to raise a popular clamor that the government should interfere between the purchaser anxious to buy and the seller willing to sell. Yet such is the object of the agitation now proceeding all over this country. Twelve years ago British capital bought up American industries in a far greater aggregate than the present proposed purchase of British ships, but there was no word of protest. Moreover, opposition on the ground of public policy would have been ridiculed most loudly in England.

"Yes," the illogical Englishman retorts, 'it was not ships then. You can buy anything we've got but ships. We must keep the carrying trade or our supremacy on the seas is useless and the foundation of our national prosperity is gone.'

"Such is the burden of public and private comment throughout the country. There are very few who dare to point out that Great Britain has no special claim on the carrying trade or any other business open to the world's competition and cannot hope to maintain her position unless she can prove as strong and as clever as all her competitors. It is this simple but bitter truth that Mr. Morgan has suddenly forced upon the British people, and it is not surprising, perhaps, if at first it is received with unreasonable resentment.

"As for the immediate fears of the Britishers the organizers of the shipping merger on both sides of the Atlantic assure the public here that their misgivings are baseless. They say that there is no intention to haul down the British flag on any ships on which it now flies and that its effect on the auxiliary naval resources of the British admiralty will be nil. This has slightly reassured the English public, but the fact remains that popular apprehension is greater over the shipping situation than any subject save one or two war scares in recent years.

"It is quite clear that nothing can be done under the existing laws of England to prevent the consummation of the deal. It is quite true in spite of the quasi-denials in the house of commons, that all the facts of the merger have been laid before the government without reserve, and there is no reason to expect the introduction of any special legislation.

"It is fast getting to be the case of 'Morgan on the brain,' in financial and commercial circles in England. The newspapers throughout the country are finding his hand in every trumpery little deal effected and scores of combinations which exist only in imagination. Meantime Mr. Morgan is himself today quietly drinking the mineral waters at Aix-les-Bains.

"There is good authority for stating, in regard to the position of the Cunard company, that that line is willing to make an arrangement similar to that entered into between the German companies and the combination. The directors of the Cunard company are unwilling either to sell out or to grant an option for the future purchase of their shares. The negotiations, however, have not been broken off."

NAVAL TRAINING STATION FOR THE GREAT LAKES.

The naval appropriation bill, as presented to the house of representatives a few days ago, carries a clause authorizing and directing the secretary of the navy to appoint a commission to select a site on the great lakes, or the waters tributary thereto, for the establishment of a naval training station. The commission is to report to the secretary of the navy the location, cost, etc., of the proposed site, and the secretary will submit his report with recommendations to the next session of congress. The action on the part of the naval affairs committee of the house is the result of a communication sent to congress by Secretary Long some months ago, in which he said that in the territory contiguous to the shores of the great lakes there were thousands of young men who would make efficient sailors if they only had the necessary training. Secretary Long recommended strongly the establishment of a naval station on the great lakes. It is thought that the clause incorporated in the appropriation bill will be agreed to by both branches of congress.

APRIL EARNINGS OF THE STEEL CORPORATION.

It is estimated that the net earnings of the United States Steel Corporation for the current month are \$11,500,000, as against \$7,356,744 in April of last year, an increase of about \$4,150,000. This showing for a month has been exceeded only once since the Steel Corporation began business, the net earnings for September, 1901, having been \$12,205,774. The net earnings for the year ended on March 31, 1902 (March estimated), aggregated the colossal total of \$111,000,000, a sum which bids fair to be largely exceeded in the year now beginning.

It is said that the United States Steel Corporation has now on its books orders involving the delivery of 7,000,000 tons of finished material.

NAVAL APPROPRIATION BILL.

The program of new ships for 1903, as presented in the naval appropriation bill now before the house of representatives, was anticipated, but the bill is in many other respects a measure of unusual interest. The report of Chairman Foss of the house committee on naval affairs, which accompanies the bill, says that comparatively few of the ships of our navy have any real fighting value. Mr. Foss accompanies this with a statement of the enormous naval armament and programs of other countries, particularly Germany. It is shown that the total number of vessels of the navy, built and building, is 138, and the total cost will be \$235,082,209. The report adds: "While we have built and are building, all told, 138 ships, yet comparatively few of them have any real fighting value. Our naval prowess lies almost entirely in our eighteen battleships, eight armored cruisers and twenty-one protected cruisers. The rest of our ships would cut but little figure in actual war. Ships of the battle line practically alone determine the naval strength of a nation."

Referring to foreign naval programmes the report says: "Of all the countries, Germany has been building during the last few years faster than any of the others. Her ship building program started in 1898, and will be completed in 1908, possibly in 1907, instead of 1916, as first planned. This program will give her in all thirty-eight battleships, fourteen large cruisers, thirty-eight smaller cruisers and ninety-six torpedo boats. After the completion of this program the plan contemplates new construction to replace ships which, though still serviceable, may have reached the prescribed age limit."

On the subject of new ships the report says: "The committee recommends that for the purpose of further increasing the naval establishment of the United States the president have constructed two first-class battleships, carrying the heaviest armor and most powerful ordnance for vessels of their class upon a trial displacement of about 16,000 tons, and to have the highest practicable speed and great radius of action, and to cost, exclusive of armor and armament, not exceeding \$4,212,000 each, two first-class armored cruisers of about 14,500 tons trial displacement, to cost, exclusive of armor and armament, not exceeding \$4,659,000 each, and two gunboats of about 1,000 tons trial displacement. In view of the fact that there is some public sentiment favorable to building ships in our government navy yards, it has been deemed advisable by the committee to insert a provision in the appropriation bill of this year leaving it in the discretion of the secretary of the navy to build any or all ships in government yards, but making it mandatory on him to construct at least one battleship or one armored cruiser in such navy yard as he may designate, as an experiment; and it is further provided that he shall keep an accurate account of all expenditures for labor and material in the inspection and construction of such ship and report to congress at each session, and upon the completion of said ship he shall make a detailed report showing the relative cost of one built by the government and one by contract. It is believed by your committee that nothing short of an experiment of this kind will show whether private contractors have been reasonable in their bids, and, furthermore, be a basis for future guidance in the continued construction of our navy. An appropriation of \$175,000 is recommended for each yard in which a ship is built. The complete cost of the two first-class battleships, two first-class armored cruisers and two gunboats, with total tonnage of 63,000 tons, will approximate \$29,500,000. These battleships and cruisers will be larger than any heretofore authorized by congress, and the plans recommended by the board of construction have already excited the favorable comment of the naval authorities abroad. The committee is of the opinion that in recommending the above naval program it is making a substantial and healthy increase of our navy, and one which will meet everywhere with popular favor."

Other interesting features of the bill are provisions for a board of naval officers to recommend a site for a naval training station at some point on the great lakes; an increase of the enlisted force of the navy by 3,000 men; provisions for a new navy ration, as reported by a naval board, and an increase of the number of cadets at the naval academy by 500. The detailed statement shows that the appropriation bill carries \$77,659,386, which is slightly below the appropriation made last year. Some of the chief items in this total are the following:

Pay of the navy.....	\$16,138,199
Emergency fund	100,000
Bureau of navigation.....	1,289,671
Bureau of ordnance.....	3,109,006
Bureau of equipment.....	5,306,202
Bureau of yards and docks.....	742,214
Public works (bureau of yards and docks).....	6,561,075
Public works (bureau of ordnance).....	392,200
Bureau of medicine and surgery.....	280,000
Bureau of supplies and accounts.....	3,803,932
Bureau of construction and repair.....	8,585,824
Bureau of steam engineering.....	3,983,900
Marine corps	2,938,465
Items involving increase of the navy are:	
Construction and machinery.....	\$13,303,010
Armor and armament.....	9,000,000
Equipment	400,000
Equipping a navy yard to build a ship.....	175,000

The naval training station in California receives \$30,000, and that in Rhode Island \$55,000; naval home, Philadelphia, \$76,000; naval war college, \$14,246. For armor and armament the bill provides \$9,000,000. This is considerably above the estimates, owing to the rapidity with which the armor makers are turning out their products.

Important items under the bureau of ordnance are: Smokeless powder, \$500,000; battery for the Newark, \$175,000; battery for the New Orleans and the Albany, \$200,000; reserve guns for auxiliary cruisers, \$250,000; reserve guns for navy, \$250,000; Newport torpedo station, \$65,000; naval militia, \$60,000.

The bureau of ordnance and bureau of equipment receive \$640,000 for depots for coal. For public work on yards and docks \$6,561,075 is appropriated, or about one-third of what was asked. The navy department made estimates for a naval station at San Juan, Porto Rico, to cost \$2,613,000, but the committee reports that "it would be wise not to provide for any naval station in the West Indies until we have more definite knowl-

edge as to the best location for one." For the completion of the four dry docks at Portsmouth, Boston, League island and Mare island \$1,050,000 is appropriated. Other public works are as follows:

Portsmouth	\$672,075	Mare island	\$225,500
Boston	702,700	Puget sound	748,500
New London	41,000	Porto Rico	50,000
New York	499,000	Pensacola	2,500
League island	447,300	New Orleans	339,000
Washington	240,000	Tutuila	93,000
Norfolk	344,000	Charleston	250,000
Key West	93,000	Cavite	233,500

The naval academy receives \$500,000 to carry out the plan of improvement. The committee calls attention to the lack of officers for the new ships and to meet this 500 additional cadets at the academy are provided for, 125 each year for the next four years. Each senator, representative and delegate in congress is to have the appointment of one, and the president twenty-four, these being allotted during the period of four years. An additional sum of \$229,905 is provided for the civil administration of the naval academy.

Under the steam engineering and construction bureaus extensive improvements are to be made in the plants at Boston, New York, Norfolk, League island, Puget sound and other points. The bill also carries \$2,938,465 for the marine corps.

SHIP BUILDING AT PHILADELPHIA.

Philadelphia, April 30.—The history of ship building on the Delaware river during 1902 will have as a prominent feature the launch of a formidable cruiser within twelve months of the date when the first plate of her keel was placed on the blocks. The craft is the Pennsylvania, building at Cramps' ship yard. Miss Coral Quay, the eldest daughter of Senator Quay of this state, has been invited by the builders to christen the vessel and has returned her acceptance of the honor. The Pennsylvania and the Colorado have been building side by side for several months. It was intended last April that the former vessel should be the first to be laid down and this plan would have been adhered to had it not been for changes in designs. As originally planned the Pennsylvania was to be sheathed and coppered, but this was changed so that both vessels are alike in every detail. In the meantime the plans for the Colorado were well advanced and it was decided to begin work on her first. The initial step in the actual construction of these vessels was taken at 5 p. m., Thursday, April 26, 1901, when the first keel plate was swung into position. Work on the Pennsylvania did not begin until the battleship Maine was launched, July 25. Since then building operations have advanced with unprecedented rapidity. The two cruisers are served by the same traveling crane, and the uniformly prompt delivery of material to the builders has contributed greatly to the quick placing of the frames and plating. Early in the present year the builders were speculating on the actual date for the launch of the Pennsylvania and planning that it should, if possible, to have it occur on the first anniversary of the keel laying. While it cannot as yet be said with certainty that this will be the case, it is within the bounds of probability.

The Pennsylvania and Colorado will be among the finest of the nation's warships. They will be longer than any other ships of the navy. On the load water line their length will be 502 ft., and their trial displacement will be 13,700 tons. Other particulars of the vessels are: Extreme breadth, 69 ft. 6 in.; mean draught at trial displacement, 24 ft.; total bunker capacity, 2,200 tons; speed, not less than 22 knots. The coal capacity will give these cruisers a radius of action greater than any other ships of the navy, nearly 10,000 knots at economical cruising speed.

The United States torpedo boat destroyer Hopkins was launched from the Harlan & Hollingsworth ship yard, Wilmington, on Thursday afternoon in the presence of a large number of spectators. Miss Alice Gould Hawes of Washington, D. C., acted as sponsor and the launch was a complete success. Like the Bainbridge, Barry and Chauncey, built by the Neafie & Levy company of this city, the new destroyer took the water with steam in her boilers and practically ready for her trial trip. The construction of the vessel was authorized by act of congress of May 4, 1898, and the contract was signed the following October. She is 245 ft. long, 23 ft. extreme breadth of beam and 6 ft. 6 in. mean draught, with a displacement of 468 tons. The engines are of the twin-screw, vertical inverted, triple-expansion type, 20½, 32 and 39 in. in diameter with a stroke of 32 in., designed to indicate about 8,000 H.P. The contract speed is 29 knots. The bunker capacity is about 125 tons. Among those present at the launch were Rear-Admiral Francis T. Bowles, chief of the navy bureau of construction and repairs; Rear-Admiral Melville, chief of the bureau of steam engineering; Col. Andrew G. Wilson, chief engineer of the Sparrow's Point ship yard, and also representation from most of the ship building firms on the Delaware.

The first consignment of pig iron from the mines of the Dominion Iron & Steel Co., Sydney, Cape Breton, was brought to this port on the British steamship Miemae. It is the first of a total of 100,000 tons to come, and will be distributed throughout the state.

The Detroit Iron & Steel Co., a blast furnace concern in which members of the firm of M. A. Hanna & Co., Cleveland, are largely interested, has been organized with a capital of \$1,500,000 and will shortly have in operation on Zug island, near Detroit, a blast furnace of 300 tons daily capacity. A coking enterprise is connected with the project. A statement of stock distribution, filed with county officials in Detroit, does not disclose the controlling interest, as such matters are usually of a formal style, but it is given for what it is worth: Daniel R. Hanna and Frank B. Richards, Cleveland, and Charles B. Warren, Detroit, 500 shares each; Frederick R. Hazard, Solvay, N. Y., 12,250 shares; Charles W. Baird, Detroit, 75,000 shares; Andrew H. Green, Jr., and Frank West, Detroit, 28,125 shares each; Theodore H. Eaton and Arthur M. Parker, Detroit, 2500 shares each.

Theodore C. Search, who recently retired as president of the American Association of Manufacturers, has been mentioned in connection with the head of the proposed department of the government to be known as the department of manufactures and commerce.

CANADIAN ENDORSEMENT OF CLERGUE ENTERPRISES.

Officials of the Canadian government are evidently still as earnest as they have been for some time past in support of the various enterprises of F. H. Clergue and his associates in and around Sault Ste. Marie, Ont. Premier Ross and his ministers recently spent some time examining Mr. Clergue's undertakings. The premier is thus quoted in Toronto:

"The object of the visit was to ascertain by personal observation the effect of the development policy of the government in the northern districts, particularly as to the mining and large works projected at Sudbury, Copper Cliff, Bruce Mines and Sault Ste. Marie. Perhaps the most conclusive evidence that could be given that this development was effective was to be seen in the large number of men employed at these points as compared with previous years, the contentment and the comfort which were apparent on every hand. In conversation with many hundreds of persons it was clearly seen that they were satisfied with the mining regulations, as they had steady employment and higher wages, and that others not immediately connected with this industry had also shared in its benefits. The new copper works at Rock Lake, involving an investment of about \$400,000 in the last two years, were substantially aided by the railway constructed as the result of a government subsidy last year. As to the development of the 'Soo,' it would be impossible to describe it in a few words. To be able to say we saw pig iron made from new Ontario ore converted into steel ingots weighing over two tons each and rolled into blooms for steel rails is to say what nobody would have believed it to have been possible two years ago, and when it is further stated that 600 tons of this pig iron is so converted daily we have some idea of one section of the work resulting from the development policy of the government. Then there is 70 miles of railway running north on which the

PLEADING FOR PENSIONS FOR LIFE-SAVERS.

President Livingstone of the Lake Carriers' Association and ex-President J. J. H. Brown of the same organization have taken special interest in trying to secure the passage of a measure by the present congress pensioning life-savers. Both President Livingstone and Capt. Brown attended in Washington, a few days ago, a meeting of the house committee on interstate and foreign commerce, at which the bill of Representative Jones of Washington providing pensions for United States life-saving crews was given a hearing. Among others present were Superintendent Kimball of the life-saving service, ex-Representative Scudder of New York and H. J. Higginson of Boston. An account of the meeting refers especially to the dramatic speech of President Livingstone of the Lake Carriers' Association, portraying the dangers of the life-saving crews incurred in their work of rescue, and comparing them favorably with soldiers on a battlefield or sailors in a naval engagement.

"Talk to me about the charge at Balaklava," declared Mr. Livingstone, passionately, "I tell you gentlemen, when you consider the intoxication of battle, the inspiration of a bugle cry to arms, the comrades surrounding you, and the wild cheers of encouragement, such an ordeal is nothing to be compared to the charge of five or six men in a life-boat, through a barrier of breakers that raise their crested heads like a stone wall. The soldier on the battlefield meets with foes who possess a conscience and mercy; the elements have none."

By this time Mr. Livingstone had the committee all interested and the members leaned forward in their chairs to catch his every word. "Hobson's brave deed," he continued, "in sinking the Merrimac will be emblazoned in song and story through all the ages to come, and not for one moment would I detract one iota of credit from that hero's matchless



A MODERN STEAM YACHT—THE AMERICA.

steel is laid, and 70 miles more graded and ready for the rails, car shops that turn out four freight cars per day, sulphite works producing 60 tons of pulp per day, all in addition to the original pulp mill, the foundation of which was laid only six or seven years ago, while the pay list now amounting to \$150,000 per month, and an army of 6,000 men variously employed, show what Mr. Clergue's energy, which is phenomenal, can do when encouraged by a government whose object is to build up Ontario."

The Hon. J. M. Gibson said: "No one can possibly acquire a proper appreciation of the importance of the industrial developments which are taking place at Sault Ste. Marie without personally visiting the locality and by observation and by examination seeing what has already been done and what is proceeding in the way of extensions and ramifications."

The Hon. Richard Harcourt said: "Every moment of our trip was most enjoyable. I was delighted with the convicting evidences of progress and prosperity everywhere existing. The people occupying those rugged north lands are full of hope and confidence in their future. Resolute, enterprising, energetic, they seem determined to make the most of nature's rich bounties, as yet only one-half disclosed. The importance of the Clergue works, their far-reaching results, the good already accomplished as regards all Canada, are not half understood, and they are being added to month by month, and by a natural process of evolution a chainwork of important commercial interests is being woven which must make Sault Ste. Marie known the world over. The newspapers keep speaking of the hum of industry, of the handsome pay roll of thousands of mechanics, and yet only one-half has been said."

Eugene B. Marquette of Milwaukee has been appointed master of the tender Hyacinth, now in course of construction for the Lake Michigan lighthouse district under the charge of Major J. G. Warren.

courage. But the life-saver who embarks in his boat with the hounds of death baying all around him, with almost certain destruction before him, deserves equal credit with the men who tried to bar the progress of Cervera's fleet at Santiago bay."

The speaker paused for a moment to catch his breath, and said with great solemnity: "The great master hath said, 'Know ye a greater love than he who giveth up his life for his friends,' and the crews of the life-boats assume this risk every time they put to sea in an endeavor to save the men who await their coming on some storm-tossed wreck."

Mr. Livingstone then pictured a number of wrecks on the great lakes in his long experience as a ship owner.

Ex-Representative Scudder described the perils endured by life-saving crews on Long island. He said in stormy weather that the fierce winds over the dunes swept the sand so thickly in the faces of the crews that they could not see a hand before them, and were frequently lost for hours while on their way to embark on an errand of mercy.

Mr. Higginson also addressed the committee, and Superintendent Kimball made a short address favoring a pension list for the men he controls.

A large steel steam yacht, the Aztec, was launched a few days ago from Lewis Nixon's Crescent Ship Yard, Elizabeth, N. J. The Aztec was designed by Messrs. Gardner & Cox of New York and is building for A. C. Burrage, a Boston millionaire and partner of Thomas W. Lawson. The yacht is 215 ft. in length on the water line and 260 ft. over all. She has a beam of 36 ft. and is to have a draught of 14 ft. Engines are four-cylinder triple-expansion and the boilers of Scotch type. The steam pressure is 200 lbs. The speed will be about 16 knots. Bunker capacity is very large as the yacht is intended for deep-sea cruising. Her owner is planning a trip around the world.

HALIFAX WANTS A SHIP YARD.

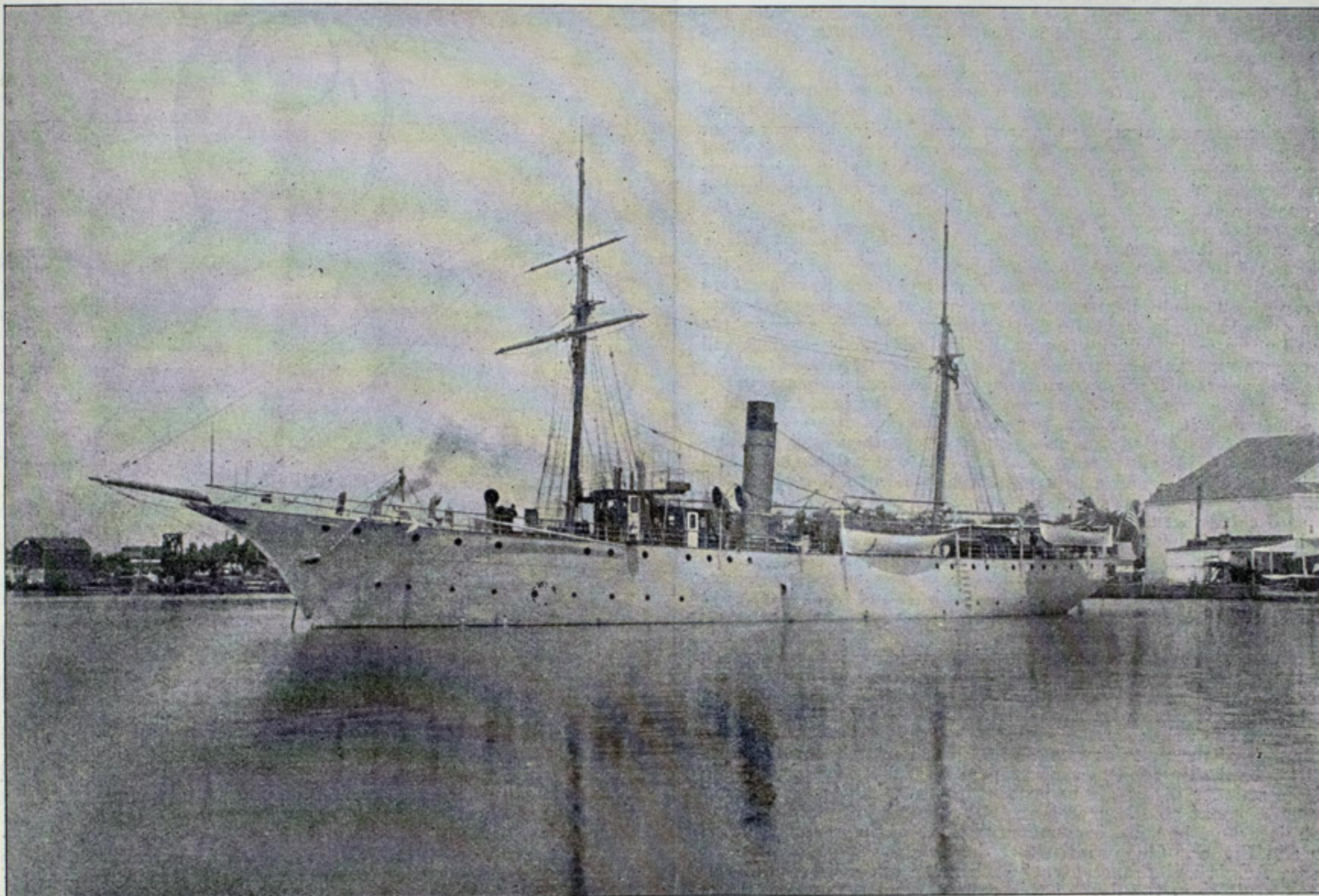
The people of Halifax, N. S., are to vote today on a proposition to grant a large bonus for the establishment of a ship building establishment within the harbor limits. It would seem that the visit of Mr. G. B. Hunter of the firm of Swan & Hunter, Wallsend-on-Tyne, England, to Halifax, some time ago, was not without purpose. The status of the matter is this:

About a year ago the city decided to grant a bonus of \$100,000 towards the equipment of a first-class ship building yard, and another \$100,000 toward the erection of a complete plant for the building of marine boilers and machinery, provided that both these establishments were erected within the city limits. Legislation was secured authorizing the payment of these bonuses and a commission was appointed to protect the city's interests and negotiate with prospective builders. The commission (of which the mayor was chairman), issued a carefully prepared circular pointing out the advantages possessed by Halifax for such an industry, and sent it to all the leading ship builders and ship owners in the United Kingdom. Letters were subsequently received from several responsible ship building concerns asking for further information, which was duly forwarded by the commission. Last January Mr. G. B. Hunter, of the firm of Swan & Hunter, Ltd., ship builders of Wallsend-on-Tyne, visited Halifax and was invited to inspect the sites considered available

WHERE PROGRESS IS EXPECTED IN THE NAVY.

In an article in the Review of Reviews, dealing with the United States navy, Rear-Admiral George W. Melville, chief of engineers, says:

"Special progress in our navy in the future must take place along engineering lines. It is exceedingly probable that in two particular directions there will be engineering advance and improvement. For over 2,000 years there has been an effort to make a practical rotary engine. The advance secured in this direction in England by the Hon. Charles A. Parsons, F. R. S., during the past twenty years, has been greater than that attained since the days when the priests of Isis used a simple form of the machine to awe their devotees. The advantages for naval purposes of a successful form of steam turbine need not to be enumerated. With the advent of the marine rotary engine will come increased reliance and security of motive machinery. The machine, however, will not only have to be efficient, but possess endurance. There are many eminent engineers at work upon this problem. Even though its successful installation for commercial and naval purposes may only be secured by development, still the world can afford to pay a large sum to make the steam turbine a practical success. The two fastest torpedo boats in the world were fitted with steam turbines, and the British admiralty will install such form of motive power in one of the torpedo boats which will be laid down this year. While this great change in the form



UNITED STATES COAST SURVEY STEAMER PATHFINDER.

for ship building. He visited all the eligible localities on both sides of the harbor (Dartmouth as well as Halifax) and expressed himself as highly pleased with the facilities of the port for ship building purposes. The firm of Swan & Hunter has since made a definite proposition to equip and operate a first-class yard in Halifax harbor, which would include Dartmouth, and supply half the necessary capital, provided they receive the bonuses that have already been offered, and also a tonnage bounty for a term of years from the federal government until the enterprise is fairly on its feet. The location of the works has not yet been definitely settled, but the chances are in favor of a site on the eastern, or Dartmouth, side of the harbor, as being in some respects most suitable. This change in favor of Dartmouth resulted in Dartmouth offering a bonus of \$100,000, and amendment of the legislative measure as far as Halifax is concerned, so as to make \$100,000 available from Halifax for a plant erected within the limits of the harbor, instead of restricting it to the city. The legislative amendment was adopted with the proviso that it must receive the sanction of the ratepayers of Halifax by ballot before becoming operative. This is the question upon which the people of Halifax are now voting. It will very probably be carried, as it is the general opinion that a ship yard in Dartmouth would be of practically as much advantage to Halifax as if it were located within the city limits.

The Westinghouse Electric & Manufacturing Co. has decided practically to double the capacity of its plant by the erection of another building nearly 1,800 ft. long and 230 ft. wide. The building will be divided into three bays, a high central one and two lower ones. The machinery to be installed will be almost a duplicate of that in the present electrical works and the product will be about the same. Contracts for the erection of the building were awarded to the American Bridge Co., about 9,000 tons of structural material being required. The Westinghouse Machine Co. is also erecting an addition to its machine department, while an immense foundry is already under way at Trafford Park.

of the propelling engine is anxiously looked for, the naval engineer is also looking for a method of generating steam more rapidly and efficiently, and it is in the direction of burning liquid fuel for naval and maritime purposes that an increase in speed and steaming radius is expected. A board of naval engineering experts has already been appointed to investigate the subject of using crude petroleum oil for naval purposes. As the test will be conducted along lines never before attempted, the confident hope is maintained that the ships of the American navy will be the first war vessels to wholly rely upon this combustible as the future steam generator."

Important changes in the administration of affairs at the navy department are taking place this week. Today (Thursday) Secretary John D. Long will be succeeded as secretary of the navy by Representative William H. Moody of Massachusetts. Rear-Admiral Crowninshield on Monday surrendered the direction of affairs in the bureau of navigation to Rear-Admiral Henry C. Taylor, the new chief, and went to New York to hoist his flag on the battleship Illinois, which will be the flagship of the European squadron and which will sail today, probably bound for Gibraltar. In assuming charge of the bureau of navigation Rear-Admiral Taylor will have as his assistants Comdr. Cowles and Lieut. Comdrs. Winslow and Niblack. The last two named take the place of Lieuts. Ward and Webster, who have been assigned to staff duty on the Illinois.

The award of \$50,000 to be distributed among the crew of the United States ship Yosemite for the destruction of the Spanish vessel Antonio Lopez in Manila bay in 1898 has just been approved by the auditor of the navy department. The Spanish craft was destroyed by the Yosemite, under command of Capt. W. H. Emory, whose portion of the bounty allowance will be \$5,000. His crew at the time of the fight numbered 300. All will share in the distribution of the bounty, and their claims will be equal to about four months' pay.

ENGINEERS IN THE AMERICAN AND ENGLISH NAVIES.

From the American Machinist.

What can be the reason why the line officer of the navy, wherever bred or found, systematically belittles the work of the man in the engine room? Why should he persist on the one hand in thrusting responsibility without corresponding authority upon engineer officers and on the other in assuming responsibilities for which he is not fitted by training or education and the natural results of which can only be disastrous, as the reports of Admiral Melville on the condition of much of the machinery of the navy shows them to have been? Our readers have been kept informed regarding the progress of the controversy in our own navy, but, bad as the condition of things, there is some left-handed consolation to be had from the knowledge that it is equally bad elsewhere, and especially in the British navy. Indeed, while at least a disposition—even though ill-advised and unfortunate in its outcome—has been shown to rectify matters at home it appears that the present tendency in England is toward a still worse condition of things. We learn from Engineering of London that the admiralty has recently issued an order of which the following is a part:

"Gunnery lieutenants to have charge of and be responsible for the care and maintenance of all gun-mountings, as well as for the hydraulic fittings in connection with the guns and hydraulically worked machines (outside the pumping engines) at present used for serving them. Torpedo lieutenants to have charge of and be responsible for the care and maintenance of all dynamos, electric motors, electric lighting, Whitehead torpedoes, and discharges."

By this order duties of a strictly engineering character are placed upon naval lieutenants. The care of the machinery described was formerly in charge of the engineering department, and it appears that this action is a makeshift action intended to meet the difficulties brought about by the policy of which it is a part, but which can have no other effect than to intensify them. The disabilities under which English naval engineers labor has had its natural effect. There appears to be no doubt that both the quantity and quality of personal material offering itself for the engineering branch of the navy has fallen off, the fewness of candidates at present making it necessary to accept anything that comes forward. This is, in effect, officially acknowledged, for the order of which the above quotation is a part, states that the new duties are transferred to the gunnery and torpedo lieutenants in order that the engineers may have more opportunity to attend to other matters. In other words, the admiralty adopts a policy which cripples the engineering department and then endeavors to meet the natural effects of its policy by extending it!

While, however, the present tendency in England appears to be worse than here, there is much more reason to hope for better things in the future there than here. Various societies of ship builders are becoming interested in the matter. Important papers have been read and discussions have been held and there is good prospect that united action will be taken by the societies and a presentment be made to the admiralty. The similarity of the conditions in the merchant and the government marine is so decided that these societies can speak with an authority comparable with that of the admiralty itself, while British interests in the merchant service are so vast that the protests of these societies can scarcely go unheeded. We have no influence in this country to compare with theirs. The average American knows little and cares less about the controversy or its merits. In England the merchant and the royal navies are equal subjects of public interest. We have neither leaders nor interested public to be led. England has both, and we shall be much surprised if the matter is not settled right there long before it is here. That there are those in England who do not take so hopeful a view of the case, however, is shown by a contributed article in the Mechanical World, in which the writer, among other things, says:

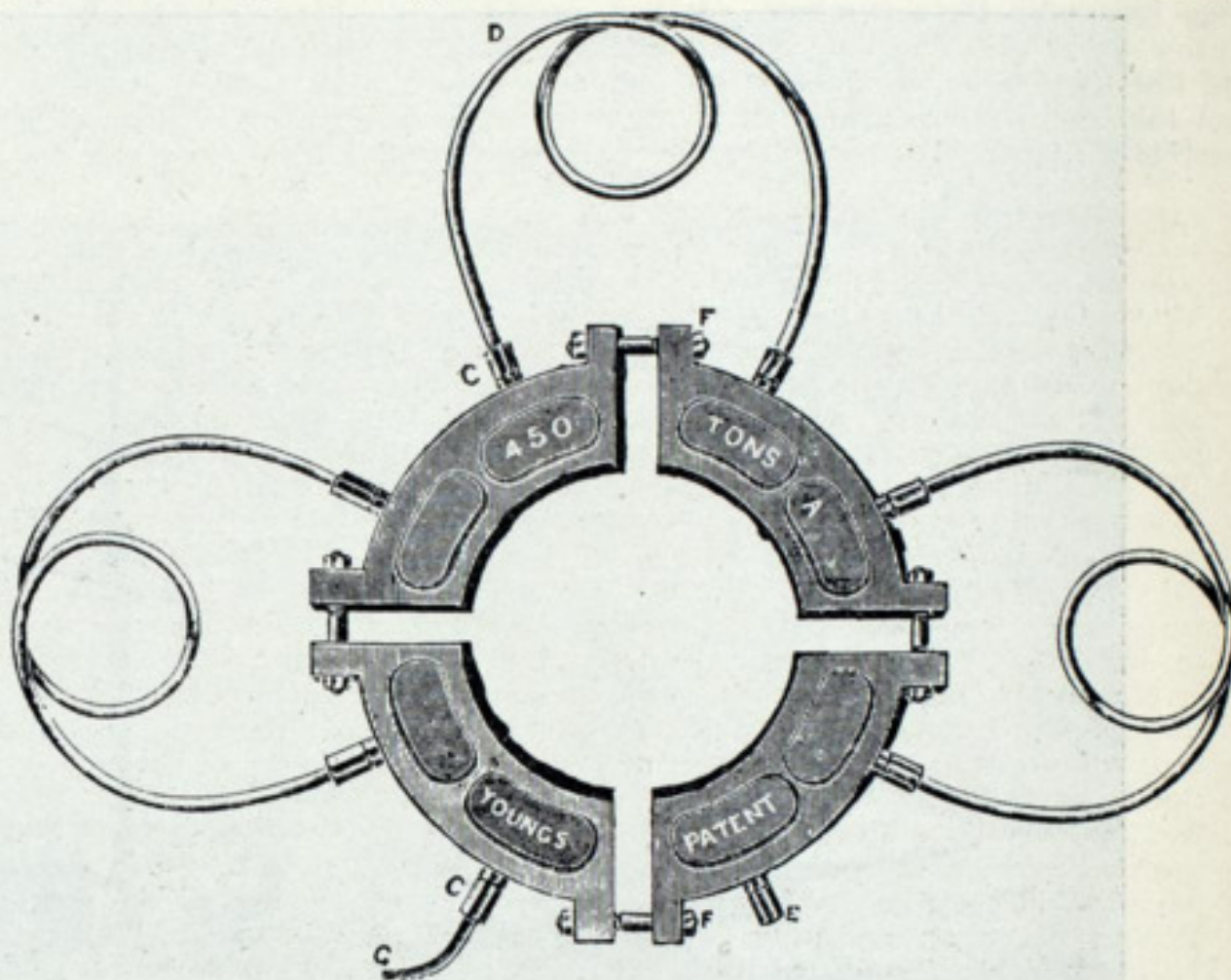
"The policy of the press as regards the navy is simply 'more ships.' Some call for battleships, others cruisers, while Lord Brassey intends to devote the remainder of his life to an attempt to convince the country that it requires more auxiliary cruisers. One writer lays it down that the British fleet must be equal in numbers to those of the combined fleets of Russia and France. Others insist that the numbers must equal those of Germany, Russia and France. They each make out a list of the battleships and cruisers in the fleet of this country, and set against it the lists of the battleships and cruisers of the foreign combination, and whichever has the longer list is said to be the stronger side. The fittings of the machine rooms in the opposing fleets are not compared; nor is the state of the engine room staff, as regards management, looked into. It is enough for the critics who call for the money that the list of British ships is not quite so long as the list of the names of the foreign combination. Thus, while millions are voted year by year simply to increase the length of the British list, the fleet so built consists of ships fitted with condemned boilers, of torpedo craft which must be brought into harbor at night for safety; that the engine room staffs are managed by men who have the responsibility without the control is a fact which is never considered. No one outside of the navy, no engineer in the efficiently-managed workshops of England, could imagine the conditions under which the chief engineers of the fleet are expected to perform their duties. The most ordinary foreman in one of the smallest departments of any engineering concern has always the power of engaging and dismissing the men under his charge; but the chief engineer of the navy has no authority over the lowest subordinate in the engine room. Sir Fortesque Flannery or Mr. William Allan may talk as they please; they may demonstrate as often as they like the absurd condition of things. The old sea lords never listen to them. Reform may be hoped for, but it never comes, and while we are waiting, the sea lords have gained the ear of the present first lord, and orders have been issued making the new status of the chief engineer worse than the first."

The Risdon Iron Works of San Francisco has been given an order to convert the iron sailing vessel Marion Chilcott, 1,511 tons, into an oil tanker. It is expected that she will have capacity of about 10,000 barrels of oil in bulk. She is to carry California fuel oil to sugar refineries on the Hawaiian islands. Over fifty sugar plantations on the islands are using coal, most of which is imported from Australia. It is calculated that a sailing vessel can make nine or ten round trips annually from San Francisco and a marked development in this oil trade is therefore looked for.

MACHINE FOR FORCING PROPELLERS FROM SHAFTS.

English shipping journals are directing attention to a special hydraulic machine for forcing propellers from their shafts. The machine is patented and manufactured by Messrs. Young of Rhyland street works, Birmingham. The size illustrated herewith is capable of giving a total effective pressure of 450 tons around the propeller boss. It comprises four segmental cylinders, each fitted with two rams of oval shape. These cylinders are only about 4 in. in depth and can be readily bolted around the shaft at the back of the propeller; the copper pipes D are then fitted to the cylinders, and the pressure is introduced through the copper tube C from an independent hand-pump, and pumping is continued until the propeller starts. Referring to the operation of the device, Fairplay of London says:

"The machine can be used for shafts from about 6 in. diameter up to 19 in. diameter, as owing to the design either two, three or four segmental cylinders can be used, as may be required by the diameter of the shaft. A smaller size of 300 tons, but with one single oval ram in each cylinder, is also made. Advantages of the machine are obvious, as by it the pressure is equally distributed around the propeller boss. It dispenses with the old practice of starting propellers by means of wedges, which was a crude, expensive, and unreliable method, and its use also abolishes the necessity for lighting a fire upon the propeller boss when the men driving the wedges find they have an extra difficult one to fetch



off. As showing the power required to start propellers we may say that in removing one from an 11-in. diameter shaft the gauge registered a pressure of 214 tons before the work was accomplished. This would have been a very difficult propeller to remove by the ordinary method of driving in wedges. A steam trawler was recently in dock with a small propeller, weighing about 14 cwt., to be removed. The men tried to remove this in the usual method and were at it a day and a night without being able to start it; it was then decided to apply to a firm who had a 300-ton propeller starter to see what assistance could be rendered. The machine was taken on board at 9 o'clock and at 9:45 the propeller was off. The pressure required to remove this small propeller was 160 tons, which shows that it was very firmly set and rusted upon the shaft. Another instance showing how invaluable the propeller starter is also occurred recently. A steamer was in wet dock with a broken propeller which had to be removed. The dry dock was full at the time, and there was only one firm in the port who would undertake the removal of the propeller, which weighed about 4½ tons; this firm had a propeller starter of 300 tons capacity. The ship was lightened somewhat astern, and the propeller starter was fixed round the shaft, the greater portion of the machine being in the water. Pressure was then applied from the hand pump and the propeller was forced off by the machine without the slightest difficulty."

PROGRESS OF WORK AT QUINCY SHIP YARD.

Boston, April 30.—The last bent of the Fore River Ship & Engine Co.'s new ship house at Quincy, Mass., has been completed and all four of the traveling cranes are in operation. While the framework of the latter half of the structure was being raised the construction of the battleships New Jersey and Rhode Island was begun forward from amidships, and as fast as a new bent was completed the work on the vessels was carried aft. The battleships New Jersey and Rhode Island, the materials for which have been accumulating in the ship yard, are now in active construction. The new steel framework of that part of the annealing plant at Quincy, which was destroyed by fire last winter, is finished and is now being enclosed. The company has taken advantage of the opportunity to enlarge the building as it reconstructed it, so that it will be possible at any time to increase the capacity of this particular part of the works, just as several of the other important features of equipment are being constantly added to as occasion requires.

The 75-ton gantry crane, which is to serve the fitting out basin, has arrived and will be put in operation in about five weeks. The cribwork for its dock foundation is well along and the materials for finishing the supporting structure on which the crane will run are in readiness. The somewhat remarkable sets of engines that are to do the work of a large part of a crew on the seven-masted schooner Thomas W. Lawson, building at this yard, are ready to install as soon as the vessel takes the water.

A dispatch to the London Globe from Christiana, Norway, says the government commission appointed to report upon submarine boats has decided in favor of the Holland type.

STEEL CORPORATION'S BOND PLAN.

Stockholders of the United States Steel Corporation are now in possession of the long expected circular regarding the proposed retirement of \$200,000,000 of preferred stock and issuance of \$250,000,000 5 per cent. bonds, and requesting proxies for use at the stockholders' meeting on May 19, when these recommendations of the board of directors will be voted upon.

The policy of the management in proposing the substitution of bonds for two-fifths of the preferred stock has been widely criticized, on the ground that the addition of \$10,000,000 a year to the fixed charges would weaken the position of the remaining preference shares and would be even more prejudicial to the position of the common stock; and it has been the view of many investors that the issue of the additional \$50,000,000 bonds is ill-advised, as the extraordinary expenditures to which the proceeds of these bonds are to be applied could have been met by deferring for two or three years the declaration of dividends on the common stock and adding to the fund thus accumulated the surplus earnings of the corporation. When it became known through the circular that \$25,000,000 of the obligations to be discharged by the \$50,000,000 bond issue represented engagements made at or immediately after the time of the formation of the corporation and before the declaration of the dividends had been begun adverse comment on the part of stockholders unfavorable to the bond issue was even more outspoken than when the bonds were first proposed. Anticipating and replying to these criticisms, the circular says, in setting forth the objects for which the proceeds of the \$50,000,000 bonds are to be used:

"Economies in manufacture still greater than those which already have been accomplished may be effected if plans of improvement now proposed be carried out. It is estimated by the executive committee that the expenditure of about \$25,000,000 for such improvements will effect a saving in manufacture of, say, \$10,000,000 annually, and also under normal conditions would substantially increase the output, thus adding from \$10,000,000 to \$15,000,000 to the yearly profits. That these expenditures could be met gradually from surplus earnings the management does not doubt; but this would necessitate extending them over a period of years, and correspondingly would postpone the realization of the profits which, by the immediate use of the money, could be obtained promptly. In Feb., 1901, various subsidiary companies had under contemplation, and in many cases actually had begun, the construction of additions to their plants, which, in some instances, would have duplicated the facilities of other subsidiary companies. The aggregate of these contemplated expenditures was something like \$50,000,000. As stated in the preliminary report of Feb. 17, 1902, much that at the time of organization it was hoped might be accomplished in the way of avoiding wasteful expenditures for unnecessary enlargement of plants has been accomplished by co-operation among the several companies, enabling one to utilize the facilities of the other. However, owing largely to advance commitments, it was impossible to stop all construction at the time your corporation was organized; and, in order to finish work then already under way, cash payments have been made during the year to the amount of \$15,000,000. Within the next few months will fall due payments, aggregating about \$10,000,000, for properties purchased almost immediately after your corporation was organized. In the preliminary report to stockholders these payments were described as 'purchase money obligations.'

"The finance committee is unanimous in its support of the executive committee's recommendations, and believes that, as desired by the executive committee, \$25,000,000 should be made available for improvements. The finance committee also recommends capitalizing both the \$15,000,000 expended during the year for commitments made prior to your corporation's organization, and the \$10,000,000 yet to be paid for properties as above stated. These three purposes in the aggregate call for \$50,000,000. The problem confronting the finance committee has been to make provision for this \$50,000,000 without issuing preferred stock, which stock cannot be sold at less than par and which, if sold at par, would be entitled to dividends at the rate of 7 per cent. and would increase by \$3,500,000 the present annual dividend requirements of the corporation."

The question whether or not the management would be justified in recommending an increase in the bonded debt, the circular says, has been exhaustively considered; and the affirmative view is presented in this language:

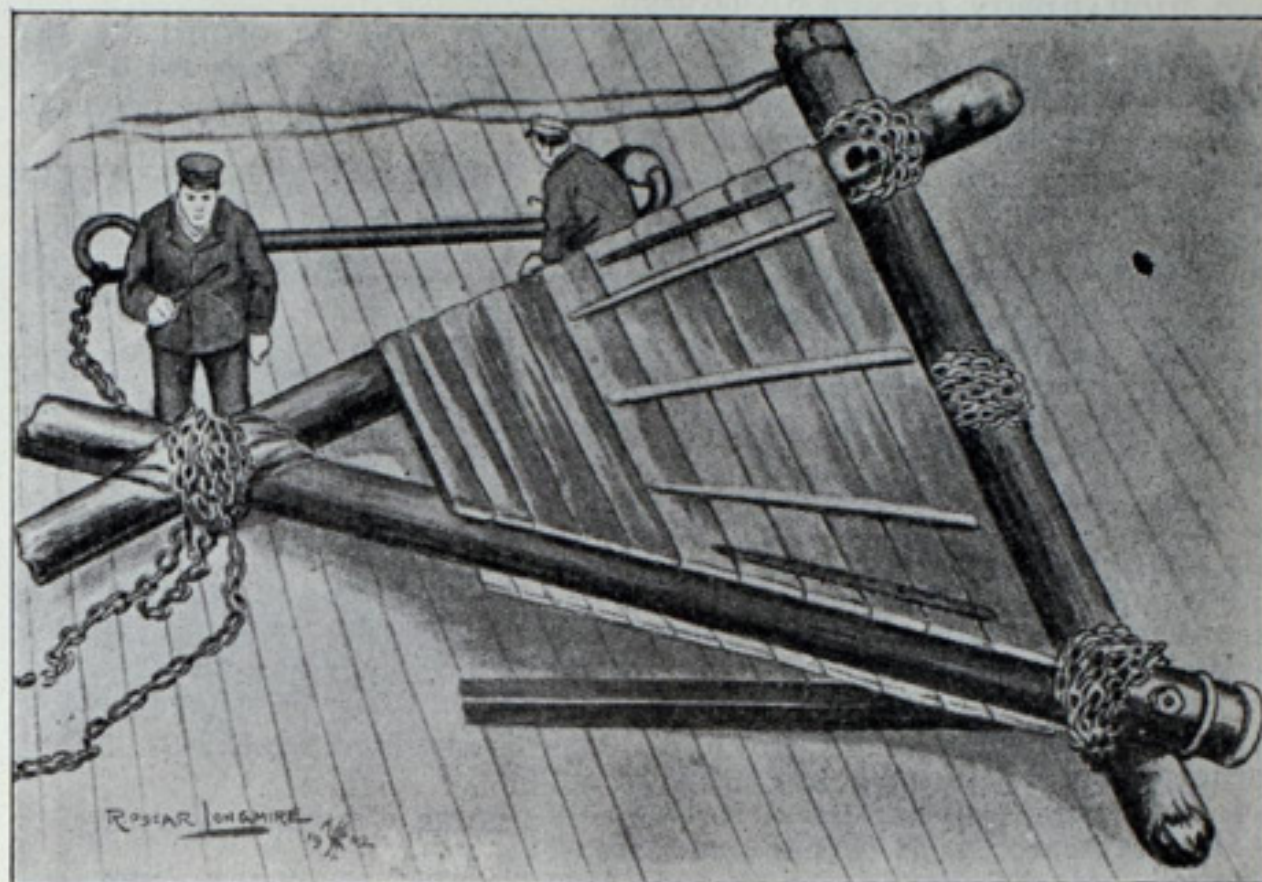
"The unanimous conclusion of the finance and executive committees is that, considering the vast aggregate value of the physical properties, the proposed \$250,000,000 increase of bonds from \$300,000,000 to \$550,000,000 is wise and conservative, the preferred stock issue being simultaneously decreased 40 per cent. or \$200,000,000. The consequent \$14,000,000 reduction of dividend payments as compared with the \$12,500,000 increase of interest would result in a net annual saving of \$1,500,000, exceeding by \$490,000 the annual sinking fund contribution of \$1,010,000 to be required by the proposed mortgage and which, invested at 4 per cent., would be sufficient in sixty years to pay off all of the \$250,000,000 bonds. An increase of bonded debt under such conditions, for such purposes and with such prospective results, is further justified by consideration of the net earnings of the properties, amounting in the past year to \$111,000,000 (being fourfold the entire interest charge of \$27,500,000 when and if the bonded debt shall be increased as above proposed) and which net earnings, by the consummation of important improvements, will be protected against the contingencies of periods of adverse business conditions. That the sinking fund may surely earn 4 per cent interest, a provision will be put in the bonds reserving to your corporation the right, any time after ten years, to call them at 110, which is better than a 4 per cent. basis, thus making it certain that your corporation, by purchasing its own bonds, can invest its sinking fund on at least a 4 per cent. basis. During the first ten years that the bonds are running your corporation, to the extent required for sinking fund purposes, may buy the bonds in the open market, provided, of course, that they can be purchased on a basis that will yield at least 4 per cent. To offset the exhaustion of ore beds, coal lands and deterioration of plants, various sinking funds are now being maintained. The further provision of this additional sinking fund to retire the proposed new bonds is in effect equivalent to retiring 40 per cent. of the preferred stock in sixty years, without increasing the aggregate of the present interest and dividend charges—in fact, decreasing them by a net saving of about \$500,000 a year. To do this, and also to obtain the substantial benefit of \$10,000,000 or \$15,000,000 annually from

economies in manufacture, and additional output by reason of improvements, is the aim of the present plan."

Accompanying the circular, which is signed by President Schwab and Chairman Gary, is a report of the finance committee to the board of directors. This report notes the enactment at Trenton of the Reed bill amending the New Jersey corporation act, under which authority is given to retire preferred stock by issuing bonds against it; and recites in full the resolutions adopted recently by the board and published at the time, declaring it to be advisable that \$200,000,000 preferred stock shall be retired and an issue of \$250,000,000 bonds be made, and calling a special meeting of stockholders for May 19 to act upon the recommendations of the board.

ETRURIA'S JURY RUDDER.

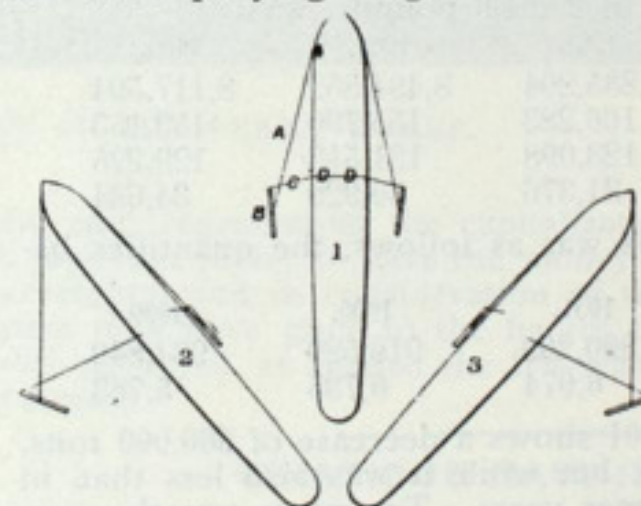
The last issue of the Review contained an account of the towing of the big Cunard liner Etruria from the Azores to Liverpool, following the loss, a few weeks ago, of her propeller and rudder in mid ocean. Reference was also made to the efforts of the officers and crew of the Etruria to rig up and make use of temporary steering apparatus before their ship was picked up and towed to the Azores by the Leyland liner William Cliff. A sketch of the jury rudder made aboard the Etruria is presented herewith. It is reproduced from Syren & Shipping of London. A tri-



ETRURIA'S JURY RUDDER.

angle of spars, weighted with a good-sized stream anchor from which the crown had been removed, was formed and the structure was decked over with planks which appear in the sketch to have been 'tween deck hatches. The barn-door-like triangle was then further weighted, and two chains were shackled to the ring of the anchor, and these were led one through each quarter pipe and another chain was shackled on for hanging purposes. Wire pennants were attached to shackles in the crown pinholes and these were led up through blocks on the ends of two booms, which projected some 15 ft. over the poop on either side. These wire pennants were thus practically the rudder ropes, and the steering was done by tackles hooked on to them.

On this question of the best method of making a temporary arrangement for steering, a correspondent in Engineering of London presents the accompanying diagram. "I am confident," he says, "that steam-



boat men who are accustomed when leaving a wharf or pontoon to cant the bow by backing on a spring, will at once see the feasibility of steering by reversing the process. Having tried the method successfully, I am of opinion that the largest steamer afloat can be steered with spars 50 ft. long, rigged as per plan, the diameter of the drag to be increased, if necessary, by lashing two or more spars together. The plan represents a vessel 170 ft. long steered with two spars, B, 20 ft. long and 1 ft. in diameter, attached to the bows with 80 ft. of rope or wire hawser, A, as delineated. To the forward end of each spar is attached about 60 ft. of ratline, C, and at D a man is stationed to haul in or slack away as required.

"No. 1 represents the vessel on a straight course.

"No. 2 is equivalent to hard-a-starboard.

"No. 3 is equivalent to hard-a-port."

Cary, Smith & Barbey, naval architects and yacht brokers of New York, announce that they intend to move their offices about May 1 from the German-American building to 90 Wall street. "In addition to our business of naval architecture," they say, "we have of late years given special attention to developing a brokerage department, which is in charge of Mr. Ernest E. Lorillard. Having London agents, we believe we have on our books all the most desirable yachts which are for sale or charter, not only in this country but abroad."

The steam yacht Avenel, which has long been a familiar craft to yachtsmen along the New England coast, will fly the flag of the New York yacht club henceforth. The yacht has been sold through the efforts of Frank N. Tandy, yacht broker of Boston, to Harry Raymond of New York city. The former owner, William S. Spaulding, is now building a steam yacht of much greater size.

STEAMER W. C. RICHARDSON.

In a few weeks a modern freighter, one of the 5,000-ton kind, will be in service on the great lakes, bearing the name W. C. Richardson. Few names are better known in lake shipping circles, and seldom has the launch of a ship in the lake region created more interest than the launch of this steamer at the Globe works of the American Ship Building Co. in Cleveland on Saturday last. By careful attention to a business in which he is thoroughly posted, Capt. W. C. Richardson has attained a position of prominence among the so-called individual vessel owners, and proof of the high regard in which he is held by these interests was found in the large number of owners and managers of vessels present at the launch of the ship that was given his name. The launching ceremony was also quite a gala affair. It was attended by many friends of Capt. Richardson other than those who know him in the vessel business. The christening was performed by Mrs. Tracy Hoyt Payne of Ashtabula, daughter of Capt. Richardson.



W. C. RICHARDSON, OWNER.

The new steamer will be owned by the Richardson Transportation Co. of Cleveland. She will be ready for service about the middle of the present month. Her dimensions are: Length over all, 374 ft.; length of keel, 354 ft.; beam, 48 ft.; depth, 28 ft. She has triple-expansion engines of 20, 33½ and 55 in. cylinder diameters, with a common stroke of 40 in. Steam will be supplied by two boilers of Scotch type, 14 by 12 ft. in size, and built for a working pressure of 170 lbs. The value of the ship is about \$220,000 and her capacity will be close to 4,900 gross tons on 18 ft. draught.

Capt. Thomas Wilford, who is to sail the Richardson, is one of the best-known ship masters of the lakes. He has been with Capt. Richardson since 1880 and has been very successful. His training goes back to the days of schooners in the grain, ore and coal trades. The first Richardson steamer he sailed was the John M. Osborne. Of late years he has brought out and sailed the well-known steel steamers J. H. Devereaux, J. H. Wade and Samuel Mitchell. He has been in command of the Samuel Mitchell for the past nine years.



THOS. WILFORD, MASTER.

MINERAL OUTPUT OF GERMANY.

The production of anthracite coal in Germany in 1901 amounted to 108,417,029 tons, eight-tenths of 1 per cent. less than that of last year, but 6 per cent. in excess of the output in 1899. The output of soft coal amounted in 1901 to 44,211,902 tons, 9 per cent. over the output of 1900 and 37 per cent. in excess of the total of 1899. Petroleum was produced in 1901 to the extent of 44,095 tons, 6,280 tons under 1900, but 17,068 tons over the total of 1899. The output of iron ore last year was 16,570,258 tons, 2,400,000 tons under the total of 1900 and 1,419,000 tons less than that of 1899. Last year 647,796 tons of zinc ore, 153,340 tons of lead ore, 777,339 tons of copper ore and 11,576 tons of silver and gold ore were produced in Germany. The output of pyrites amounted to 157,420 tons. The large decrease in the production of iron ores (2,400,000 tons) is due to the depression in the metal industries. The production of iron, zinc, etc., in tons of 2,204.6 pounds, was:

	1901.	1900.	1899.
Raw iron	7,835,204	8,494,852	8,117,594
Zinc	166,283	155,790	153,155
Lead	123,098	121,513	129,225
Copper	31,376	30,929	34,634

The production of precious metals was as follows, the quantities being in pounds:

	1901.	1900.	1899.
Silver	890,209	916,529	934,849
Gold	6,074	6,735	5,783

The production of raw iron in 1901 shows a decrease of 660,000 tons, or 7.8 per cent., compared with 1900; but while it was also less than in 1899, it still considerably exceeds former years. Ten years ago the production of raw iron was 4,640,000, 41 per cent. less than in 1901. The value of raw iron in 1901 decreased more than the quantity. It was 488,700,000 marks (\$116,310,600), against 549,100,000 marks (\$130,685,800) in 1900, a decrease of over 60,000,000 marks (\$14,300,000), or 11 per cent. The value of a ton of raw iron in 1901 was 62.38 marks (\$14.85), against 64.64 marks (\$15.38) in 1900 and 55.95 marks (\$13.32) in 1899. The value of products of raw iron was:

Years.	Cast iron.	Wrought iron and steel.	Iron and steel ingots.
1901	\$62,522,600	\$28,036,400	\$189,614,600
1900	79,349,200	41,364,400	226,814,000
1899	75,398,400	43,649,200	198,825,200
1898	63,879,200	36,842,400	167,837,600
1897	57,381,800	34,986,000	141,442,200
1896	52,336,200	35,152,600	128,424,800
1894	40,079,200	30,178,400	91,844,200
1892	37,723,000	38,556,000	79,944,200

Mr. W. M. McFarland, acting vice-president of the Westinghouse Electric & Manufacturing Co., will deliver a lecture on "Electric Power Distribution in Manufacturing" at Cornell University on Friday, May 9. The several different systems of distribution and their relative advantages will be discussed and the manner of applying electric motors to machinery will be illustrated by a large collection of stereopticon views.

THE COMBINATION AND THE GERMAN SHIPS.

A comparison of the strength of the German steamship lines and the Morgan combination shows how vitally necessary to the success of the merged lines is the co-operation of the German companies. The following table, which is not official but approximately all right, shows the number and tonnage of ships in the American combination:

Line.	No. of ships.	Tonnage.
Leyland	46	293,015
White Star	26	250,000
American and Red Star	26	186,000
Dominion	8	73,749
Atlantic Transport	12	78,798
Total	118	881,562

A summary of the strength of the German lines, including their lines to the Orient, is as follows:

Line.	No. of ships.	Tonnage.
Hamburg-American	136	668,000
North German Lloyd	120	556,178
Total	256	1,224,178

Not only have the Germans more vessels and greater tonnage, but their passenger ships are most commodious and the fastest afloat.

RUSSIAN SUBSIDY SCHEME.

A press dispatch from St. Petersburg gives further details of the very original plan of the Russian government for the encouragement of ship building, referred to several times of late in these columns. The dispatch says that Grand Duke Alexander Michailovich, who is competent in the matter, turned the project over to the St. Petersburg Vedomosti in order that it might be freely discussed. He invites critics to address him personally. Beneficiaries, under the plan, which follows, are to be Russians exclusively, or companies whose stock is held only by Russians.

1. Owners of new ships, made in Russia from Russian materials, will receive from the government a non-interest bearing loan to 50 per cent. of their value, payable in equal twenty-year instalments.
2. Plans and specifications of such vessels, which must be Lloyd's first class, must be approved by the finance ministry, and vessels exceeding 1,000 tons must make 10 knots; smaller vessels must exceed 8 knots.
3. The government assumes insurance risk up to two-thirds of the current value of a ship, charging therefor a premium of 2 per cent. annually. Owners must insure the remaining risk. The current value can never be taken at less than half the original value.
4. The state will pay for half the fuel consumed, provided Russian fuel is used, on voyages to and from Russia, and on condition that outgoing vessels are loaded to three-fourths of their capacity with Russian goods, and, on return trips, have at least one-half their space occupied.
5. The same favor will be enjoyed by vessels plying between Russian ports, providing one-half the cargo is foreign-going goods, or that the entire initial cargo is salt, fuel, iron or cast iron from the Azof and Black seas to the Russian ports on the Baltic.
6. The subsidies are limited to eight years, from Jan. 1, 1903.

TO INSPECT NORTH ATLANTIC SQUADRON.

The four stars of Admiral George Dewey are again to be hoisted to the main truck of a warship, where they have not flown since being lowered from the flagship Olympia in New York harbor, October, 1899, on his return from the command of the Asiatic station. The dispatch boat Dolphin is to carry him and a number of naval officers off the Virginia capes the latter part of this week for the purpose of inspecting the North Atlantic squadron, now on its way home from the winter cruise. Orders have been prepared assigning the admiral to the Dolphin with a staff consisting of Rear Admiral Henry C. Taylor, Lieut. A. P. Niblack, inspector of target practice; the admiral's personal staff and others. On May 1 an officer will be sent from Norfolk to meet the fleet off the capes and notify it to be prepared for inspection beginning May 2 and extending probably a week. After the inspection the admiral will observe the ships' maneuvers and at target practice. Later the squadron will proceed to Hampton Roads and subsequently to the New York and Boston navy yards for general overhauling, preparatory to summer work in New England waters. Admiral Dewey will be the first admiral of the navy to perform such services since the days of Farragut. Admiral David D. Porter never went to sea in an official capacity after coming to Washington as senior officer of the navy, and Admiral Dewey has scarcely stepped foot on shipboard since he came back from Manila.

George Stratford, founder of the George Stratford Oakum Co. of Jersey City, N. J., well known to the marine trade of the country, died at his home in that city a few days ago. Mr. Stratford was in his seventy-first year. He was one of the pioneers of the oakum business in this country. He superintended a government oakum mill at the Brooklyn navy yard in the early fifties. The oakum business in Jersey City which bears his name was established forty years ago. He was also the founder of the Jersey City Paper Co. Active management of the oakum company has for some time past been entrusted to his sons.

At the annual meeting of Jones & Laughlins, Ltd., Pittsburgh, held last week, officers were re-elected as follows: B. F. Jones, chairman; Willis L. King, vice chairman; Irwin B. Laughlin, treasurer; William C. Moreland, secretary; William L. Jones, general manager, and Thomas K. Laughlin, assistant treasurer. The board of managers elected consists of B. F. Jones, Jr., Willis L. King, Irwin B. Laughlin, William C. Moreland, William L. Jones, James B. Laughlin, Roland Geary and Thomas O'C. Jones.

A revision in colors of chart No. 3 of the St. Marys river has just been issued. It may be had from the Marine Review.

IMPORTS LARGELY MANUFACTURERS' MATERIALS.

Practically one-half of the importations of the United States are now manufacturers' materials. Of the importations of March, whose details have just been announced by the treasury bureau of statistics, 49.13 per cent. consisted of manufacturers' materials, and amounted to \$41,381,755 out of a total importation of \$84,230,559 during the month. For the nine months of the fiscal year ending with March, manufacturers' materials formed about 46 per cent. of the grand total, being \$310,792,429 out of a total of \$678,698,016.

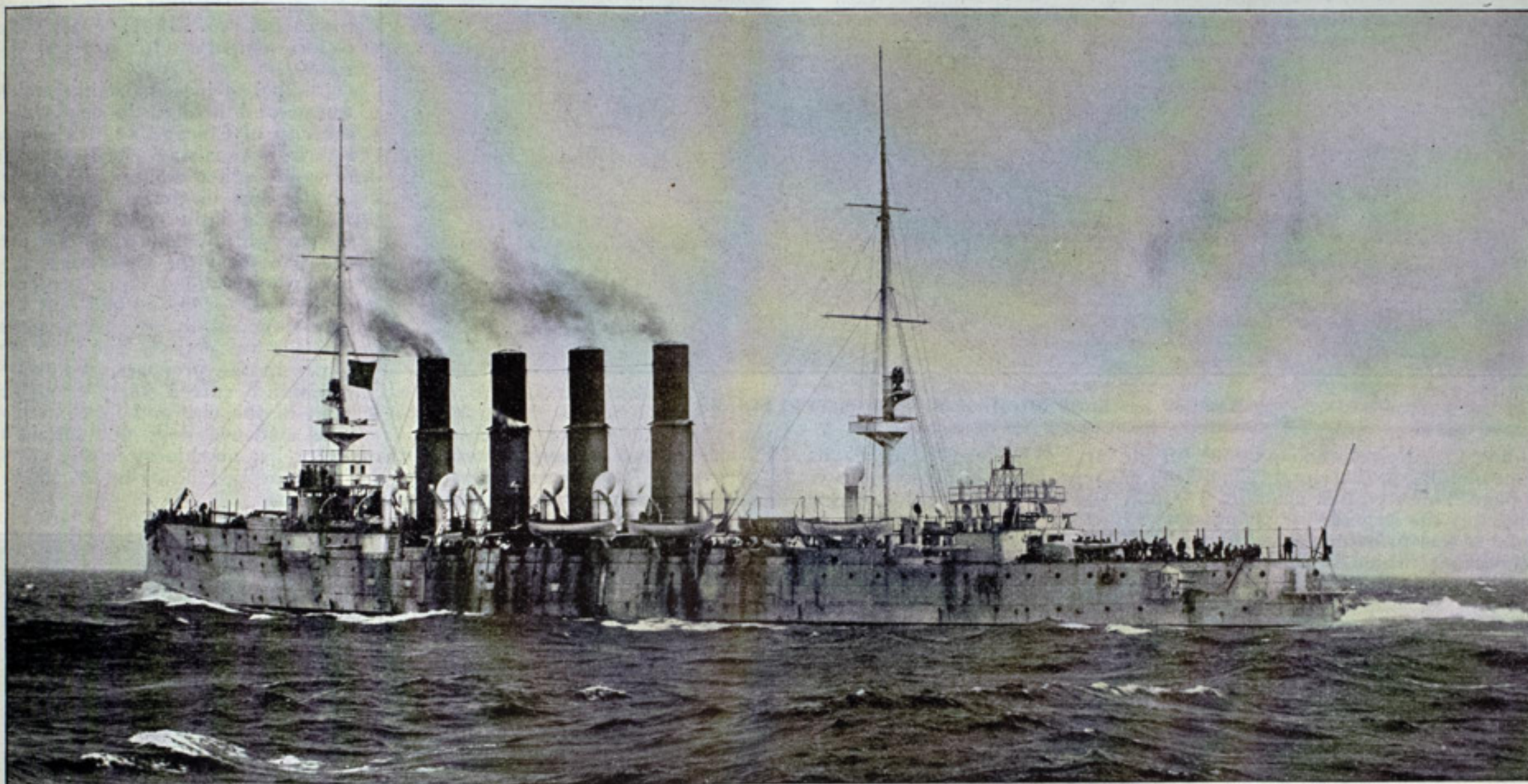
Importations of manufacturers' materials will in the fiscal year which ends with next month by far exceed those of any preceding year in the history of our industries; the highest figure ever reached in any preceding year was that of the fiscal year 1900, when the grand total was, in round terms, \$390,000,000. In the present year it seems likely to attain the enormous sum of \$425,000,000. In 1890 manufacturers' materials formed but 34 per cent., or practically one-third of the importations; in 1895, they formed 37 per cent., and in March of this year, as already indicated, they formed 49.13 per cent., or practically one-half of the grand total of importations.

Ten great articles form the bulk of the manufacturers' materials imported. These are fibers, hides and skins, india rubber, raw silk, tin, unmanufactured wood, wool, copper, raw cotton (chiefly Egyptian), and a large proportion of the articles classed under the general head of "chemicals." The table which follows shows the total importations, in value, of these ten great classes, forming the bulk of the manufacturers' materials imported. It will be observed that in all cases except india rubber and tin there is a marked increase in the nine months of the present fiscal year compared with the corresponding months of last year. In the case of tin,

STATUS OF ISTHMIAN CANAL MATTER.

Propositions of the Colombian and Nicaraguan governments in connection with the proposed isthmiian canal are expected by congress from the president almost any day now. The president is exceedingly anxious that, whatever determination congress may come to as to the relative merits of the two routes, some decision may be reached at this session. A comparison of the outlines of the agreements or treaties made by the state department with Colombia, in relation to the Panama canal, and with Nicaragua and Costa Rica, as to the Nicaragua canal, shows a general resemblance in the scope of the arrangements, but important differences in details. One point of resemblance is the amount of money to be paid down at once by the United States government to the country making the concession. In each case this is \$7,000,000. If the Panama route is chosen Colombia gets all of this money. If the choice falls on the Nicaragua route, Nicaragua will receive \$6,000,000 and Costa Rica \$1,000,000. A good deal of the delay that has occurred in consummating the arrangements was owing to the difficulty in reaching a basis of division as between Nicaragua and Costa Rica, and this is generally fixed upon as about six to one in favor of Nicaragua.

No provision is made in the Colombian protocol for the payment of any annual rent—that matter will be left to future adjustment, though, of course, it is expected that some rent will be charged. The agreements as to the Nicaragua canal, however, specifically state that the rent to be paid is \$30,000 per annum, of which Nicaragua will get about \$25,000 and Costa Rica \$5,000. While this rent is merely nominal, it serves a useful purpose in the estimate of the isthmiian republics, namely, to continually assert the nominal sovereignty of Nicaragua and Costa Rica over the territory through which the canal is cut. The original proposition was to pay a



RUSSIAN CRUISER VARIAG—A PRODUCT OF THE CRAMP WORKS.

in which a slight decrease in value is shown, the figures of quantity exceed those of the corresponding months of the preceding year, while in india rubber the slight reduction in total value is also due, in part, to a reduction in price.

IMPORTATIONS OF MANUFACTURERS' MATERIALS—NINE MONTHS ENDING MARCH 31, 1902.

	1901.	1902.
Total manufacturers' materials.....	\$247,783,462	\$310,792,429
Principal articles:		
Hides and skins.....	\$33,165,417	\$44,187,774
Chemicals, etc.	39,281,736	43,339,560
Raw silk	19,531,319	33,188,523
Fibers	16,128,152	22,955,194
Copper	14,016,009	19,762,870
India rubber	20,033,924	18,855,769
Wood, unmanufactured	11,132,727	13,959,732
Tin in pigs, etc.....	14,486,223	13,414,046
Wool, raw	8,743,510	12,615,874
Cotton, raw	5,163,487	9,145,333

Capt. J. G. Keith, vessel owner of Chicago, has been in Toronto again of late trying to secure from the municipal authorities, for a transportation company in which he is interested, certain terminal property for railway and steamship connections. The company in which Mr. Keith is interested has a scheme for establishing steamship service from Fort William, Port Arthur, Duluth, on Lake Superior, and from Chicago, on Lake Michigan, to Collingwood, on Georgian bay, where necessary freight sheds and docks would be built. From Collingwood to Toronto, a railway would be built, and then from Toronto steamship service would be established to the Atlantic.

lump sum representing the capitalization of this rent for 100 years, but the republics prefer to have the money paid yearly in recognition of their sovereignty, and in consideration of the allowance of their wish in this matter they have gone to the length of making the lease in the United States perpetual, as against the 100-year renewable lease of the Colombian agreement.

WHAT OUR NAVY IS COSTING US.

A navy is a costly institution. Large appropriations are essential for its maintenance. From the fact that the warship contains machines crowded together, and designed to an extreme degree of lightness, depreciation of a battleship is very rapid. The design, also, soon becomes obsolete; so, altogether, it requires a heavy outlay to secure or maintain naval supremacy. The actual cost of our completed fighting vessels, and the total estimated cost of those building, will probably reach \$275,000,000. This represents but a half of the actual expenditure incurred in creating a navy. In addition to the fighting ship, there are required for naval purposes numerous auxiliaries, such as dock yards, educational institutions for the training of men and officers, docks, and coaling stations. In the shape of auxiliary vessels we must have many gunboats and tugs. The collier, repair, hospital, supply, and training ship each has a sphere of usefulness. It is the indirect outlay that swells the expenditures in the navy, as well as in the army. As an example of how excessive are the indirect expenses in time of war, it has been estimated that each soldier in the Philippines costs the army \$1,500 per annum, although the pay, ration, and clothing of the enlisted man will not average one-third of that amount. It costs us at least 30 per cent. more than it does any European power to build a warship. It costs us 30 per cent. more to keep our service in operation, since the expense of living is greater here than elsewhere. The minimum expense in keeping one battleship in commission cannot be less than \$1,000 per day.—Rear-Admiral George W. Melville, in Review of Reviews.

IMMENSE CHAIN FOR PACIFIC LINERS.

The Newhall Chain Forge & Iron Co., 9-15 Murray street, New York, sends the Review a couple of shop views showing the immense chain which they some time ago contracted to deliver to the Eastern Ship



MAKING IMMENSE CHAIN FOR HILL PACIFIC LINERS.

Building Co., New London, Conn., for the large Hill steamers for Pacific service building at that point. The views are reproduced in illustrations on this page. This stud-link chain, of 3 3/16 in. size and about 6,000 ft. length, is probably the largest ever manufactured. It was to be made to Lloyd's specifications, which in this instance required a breaking strain of 220 3/4 gross tons, or 494,840 lbs. A report from the Lebanon Chain Works, Lebanon, Pa., where the chain was made, says of the tests:

"In the first test the strain was run up to 510,000 lbs., developing no defects in the chain. In a second test a strain of 549,500 lbs. broke the jaw and feed of the testing machine, but did not fracture a weld or link of the chain, thereby not only proving that the chain exceeded the requirements by 55,020 lbs., or 27.51 tons net, but leaving doubt as to what strain would be required to part the chain."

CASE OF COLLISION WITH WATER WORKS CRIB.

Judge Kohlsaat in the United States district court at Chicago has just decided the Conestoga case, wherein the Erie & Western Transit Co. endeavored to collect from the city of Chicago large damages on account of the collision of the steamer Conestoga with a waterworks crib off Chicago harbor. The decree, which is given in full herewith, divides the damages equally between the city of Chicago and the steamer:

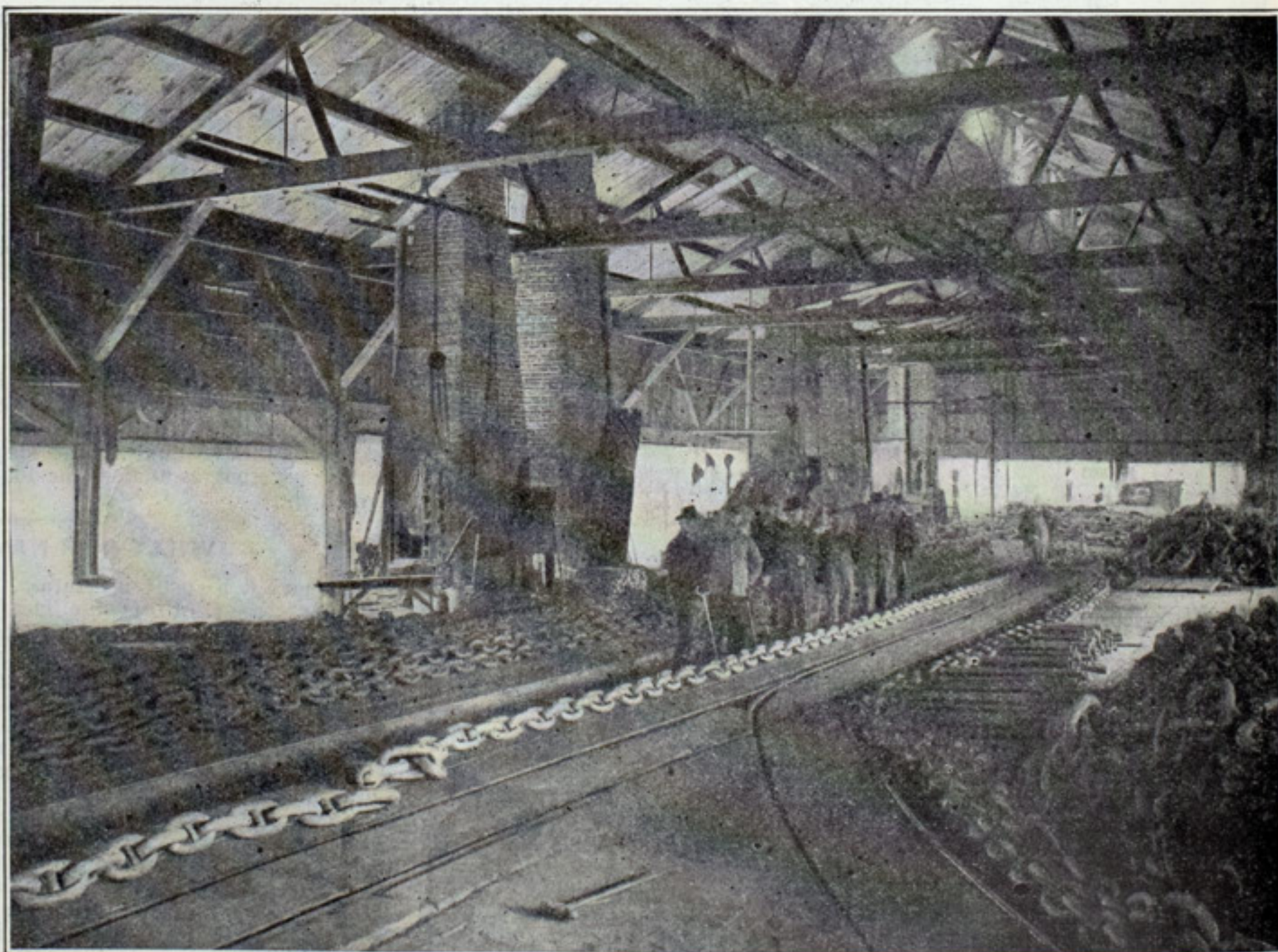
"The libel in this case seeks to recover for damages sustained by reason of a collision between the steamer Conestoga and what is known as the Carter H. Harrison crib, situated about 2 3/4 miles in a northeasterly direction from the Chicago pier. The accident occurred at 12:55 a. m. of Nov. 16, 1899, during the prevalence of a dense fog. The steamer made the trip from Milwaukee to the crib, 82 1/2 miles, in 8 hours and 55 minutes, or an average speed of more than 9 1/2 miles an hour. Her usual speed was 9 miles an hour. There was little or no sea or wind. It appears from the evidence that the usual lookout and sounding of whistle were observed upon the steamer.

When the crib came into view it was almost ahead and 150 ft. distant from the steamer's bow. The crib was about 112 ft. in diameter and had displayed on its northwest side a light at a height of about 50 ft. This lantern was substantially like the usual anchor light, the glass cylinder being about 7 in. in diameter and having a horizontally-corrugated surface, and being of about 80 candle power. No other signal was given.

"The superstructure of the crib stood at an elevation of about 27 ft. from the water line. There was a bell upon the crib which had been used during the construction of the masonry of the superstructure, but which had not been used, or even mounted, for about three months. Previous to the building of the crib the city had secured the usual consent of the secretary of war, as required by law. This provided that 'suitable lights and such aids to navigation as may be required by the lighthouse establishment shall be maintained on the crib superstructure by the city of Chicago, Illinois, and at its expense.' The lighthouse establishment took no action in the matter. The steamer struck head on and was so severely broken that she sank in about 40 minutes, in 20 ft. of water. She carried about 1,000 tons of general merchandise. Libellant claims damages to cargo, \$67,034.04; cross-libellant claims damages to steamer, \$23,260.09.

"Libellant insists that the accident was caused through the negligence of the city of Chicago and the contractors in not causing a bell to be rung or some other audible signal to be given; that in the condition of the weather, a light could not be seen far enough to enable a vessel to avoid the crib; that the Conestoga, at the time she collided, was proceeding under half speed and had only headway sufficient to give steerageway; that she was entirely free from negligence in the premises, and that the collision occurred solely through the fault of the city and its contractors. The evidence does not sustain the

charge that the vessel was unseaworthy or her machinery in any way defective. Her officers claim that she was checked down to 4 1/2 miles an hour, 30 minutes before she struck.



INTERIOR OF CHAIN WORKS AT LEBANON, PA.

"We have then a steamer 265 ft. long over all, heavily loaded, coming up the lake into the known vicinity of the various obstructions located in the Chicago harbor, at the admitted speed of 4 1/2 miles an hour, in a fog so dense as to prevent a light being seen at a distance exceeding 150 ft.; the light, it must be remembered, being upon a superstructure

112 ft. in diameter and at a height of about 50 ft. I am not satisfied from the evidence that the speed did not exceed $4\frac{1}{2}$ miles an hour. In my judgment it did somewhat exceed that rate. Sailing rule 15 provides as follows: 'Every vessel shall, in thick weather, by reason of fog, mist, falling snow, heavy rainstorms, or other causes, go at moderate speed. A steam vessel hearing, apparently not more than four points from right ahead, the fog signal of another vessel, shall at once reduce her speed to bare steerage way, and navigate with caution until the vessels shall have passed each other.'

"What is moderate speed must be determined by the circumstances of each case. Every vessel has the right to proceed with speed sufficient to maintain steerage way. Taking into consideration all the conditions existing at the time of this accident, I am of the opinion that the Conestoga was going at a rate faster than was necessary to maintain steerage way and greater than was justifiable; and that, had she slowed down to her lowest steerage way gait the accident might have been, to a great degree, avoided by prompt action on the part of her officers and crew. The evidence, however, fairly warrants the conclusion that, had some reasonably audible signal been given from the crib those in charge of the steamer might have sooner made out the crib and avoided, or at least greatly reduced, the damage caused thereby.

"There is no evidence of any regulation or established rule prescribing what signals or alarms should be given under the circumstances such as obtained in this case. It would seem that the court must be guided by the particular facts in each case. The bell was at hand and could easily have been made available. If the weather was as heavy and dense as is claimed, to have done so would certainly have been a reasonable precaution. I am of the opinion that both the vessel and the party or parties in charge of the crib were, under the circumstances, negligent, and by such negligence jointly contributed to the happening of the accident in question. The finding of the court will be that the Erie & Western Transportation Co., owner of the Conestoga, is liable for and decreed to pay one-half of the damages growing out of said collision; and that the other half be paid as hereinafter stated, subject, however, to such modification as may grow out of the application of the so-called Harter act, and the stipulations of the bills of lading.

"There remains yet the question as to who is responsible for the negligent omission to give some audible signal from the crib to approaching vessels on the night in question. It appears that the Fitzsimons & Connell Co. took the contract from the city for the construction of said crib and was required by its contract to protect the city in such case while the structure remained in its possession. The only question I deem it necessary to consider is: 'Who was in possession on the night of the collision?' So far as libellant is concerned, the city must be held liable in any case, and this inquiry goes only to the extent of determining, as between the city and said contractors, which is liable. There seems to be some considerable contention as to whether the contract was entirely performed at the time of the accident. By the contract the work should have been completed by Jan. 1, 1897. If, however, the city had taken possession at the time in question, manifestly the city was the party responsible for the neglect. From the evidence I am clearly of the opinion that the city had possession and that, at the time of the accident, the Fitzsimons & Connell Co. was not in possession. The mere fact that it did later remove some earth from the base of the crib and bulkheads from the intake opening, is of no importance in determining this fact. The city's men, one of them an assistant crib-keeper, were on the crib alone. No representative of the Fitzsimons & Connell Co. was there and the city had taken complete charge and control.

"The other half of the damages sustained as above, should be charged against the city of Chicago, subject to the modifications, if any, growing out of the terms of said bills of lading. The matter is referred to Commissioner Lewis F. Mason to ascertain the damages, and the question of the apportionment thereof will be disposed of by the court when the report of the commissioner is filed."

ORE DEPOSITS OF SWEDEN.

We have frequently pointed out in these columns that the principal asset of the United States Steel Corporation is its control of raw material. It owns, it is estimated, nearly 80 per cent. of the iron ore deposits in the Lake Superior district. It is also buying more in various parts of the world. According to the Engineer of London the Steel Corporation has bought the Gellivara Iron Ore Co.'s mines in northern Sweden. Discussing the subject, the Engineer says:

"The production of ore in Sweden in 1900 was 2,607,925 tons, in comparison with 2,434,606 tons in 1899 and 2,038,094 tons in 1896. About 40 per cent. of the 1900 total came from Närhattenlän, nearly the whole quantity being the output of the Gellivara mines. The Kopparberg district furnished 32 per cent., and Orebro 12.50 per cent. In the 'Annual Review of the Swedish Iron and Steel Trade' it is stated that the production of ferrous rock was 4,530,000 tons, which yielded 2,582,029 tons of dressed ore, or 58 per cent. The Gellivara contribution averaged 61.8 per cent. As much as 89.6 per cent. of all the ore obtained in the country was magnetic. Sweden might readily increase its output of ore, but it labors under disadvantages in relation to the progress of iron and steel manufacture within its own borders; and English ironfounders, having exploited Spain, and finding that country equal to its requirements, have not been attracted to the mines of Sweden. Considering the disability under which it suffers from the lack of coal, Sweden continues to hold its position very well. The production last year was less than 250,000 tons and the whole of that was anthracite, useful for railway and steamers and domestic consumption, but not for the iron industry. As a consequence of its poverty in this respect the country is under the necessity of importing large quantities of fuel to keep its ironworks going. It draws mainly upon the United Kingdom for its coal, and, as a fact, it took from us last year 4,500,000 tons. But for this there can be no reasonable doubt that Sweden would have been heard of to much better purpose in this particular. In all other respects the conditions are favorable—more favorable, perhaps, than in Germany—certainly more favorable than in Belgium and France, if only for the presence of very high grade ore right at the door of the mills. There being, in these circumstances, a limit to Sweden's capacity for progress in iron manufacture, and its deposits of ore being exceedingly abundant, there is no good reason why some of this wealth should not be utilized by other

countries; but we should have liked to see the Gellivara mines pass into the control of Englishmen instead of an all-absorbing American combine. It behooves us to profit by this evidence of American 'liveness.' The supplies of good grade ore in the Bilbao district are becoming thinned at a very rapid rate, and while there are other deposits they are of lower grade, and for the most part they are not capable of development without large outlay on railways to connect them with the ports of shipment. The United Kingdom is not making the headway we should like to see it make in iron manufacture, but to produce even 8,000,000 or 9,000,000 tons of pig iron in a year requires more ore than we can command; and it might be the part of wisdom to look around for other important sources of supply, in view of the exhaustion of Spain's resources within a generation or less. And of these other sources none are so promising as Sweden. The Gellivara mines, with their annual output of over 1,000,000 tons, are not in the market; but there are other important producers, notably the Grängesberg mines in the Kopparberg, and more which might be named in Gefleborg, Vestmanland, Vermlands, and Orebro, to say nothing of localities known to contain ore, but not developed by reason of insufficient encouragement. Then further north than Gellivara are enormous beds quite untouched. With the completion this year of the railway from Gellivara to Ofotenfiord, on the Norwegian seaboard, the deposits of magnetic at Kiirunavaara, and the more moderate deposits at Luossavaara, in the same neighborhood, will be made readily and cheaply accessible. The enterprise of the Swedish government in constructing a line in the extreme north of the country has made this possible; and, as a result, European ironmasters will be enabled to supplement their present supplies of ore with inexhaustible quantities of Swedish ore, averaging 67 per cent. of iron. On the Kiirunavaara range there is an unbroken stretch of three miles of ore-bearing ground, the deposits averaging from 100 ft. to 840 ft. in width, and a very conservative computation puts the total amount of ore waiting to be raised at 215,000,000 tons. The Luossavaara deposit extends for 4200 ft., has a maximum width of 200 ft., and contains at least 18,000,000 tons of ore. These estimates are concerned only with the ore above the level of Lake Luossajarvi. There is every reason to believe that the veins persist below the level of that lake; but this may be left a neglected quantity until that time in the distant future when the more readily available material shall be in danger of depletion. It is doubtful if the Swedish government will permit the exportation of all ore of which the mines will be capable, its policy being one of caution and moderation. At present the intention is to ship abroad about 1,600,000 tons annually. But the total spoken of as the maximum annual export will make a material addition to the resources of English and continental ironfounders. The Belgians and Germans in particular, have had their eye on these Swedish deposits. Thanks, in the main, to their orders, the output of the mines for three or four years from the date of opening has been contracted for. But English makers have also been in the field, and, bearing in mind the ever-growing demand in all the manufacturing centres of Europe for high grade ores, there need be no fear for the future prosperity of the Kiirunavaara-Luossavaara field, in spite of its position in an unattractive country. We shall probably hear soon that the Steel Corporation will take a hand."

THE TROUBLE WITH CONDENSER TUBES.

Discussing the increasing frequency with which condenser tubes in war ships are giving out, the Engineer of London says that experience in United States naval vessels at least appears to locate the trouble mainly in the too small size of the condensers for their work. The most noteworthy defect is that the tubes disintegrate and lose strength a short time after they have been put to work. They become so brittle that they may be broken up into small fragments with the greatest ease. It is held that this result is due to the tubes being called upon to transmit too much heat; that, in short, the passage of successive waves of heat as the exhaust ports open and close works a molecular change. Formerly twice to two and one-half times as much cooling surface was allowed for a given power as is now available, and there was no trouble. There is practically no trouble now with condensers in the mercantile marine. How or why the transmission of heat should operate to this end is not stated. There is, however, another cause of disintegration at work; the tubes used are very long, and the diameters small. Tubes $\frac{5}{8}$ in. in diameter and only 18 or 20 gauge thick are quite common. When the steam rushes into the condenser in rhythmical beats, it apparently sets the tubes vibrating, and this may go far to explain the brittleness which undoubtedly is manifested by the tubes, and that to a very remarkable extent after they have been in use some time. Furthermore, it is the fixed opinion of competent authorities that simply drawing a 16-gauge tube two gauges thinner, or down to 18 gauge, notwithstanding the annealing, "takes the life out of the metal;" that, in fact, the thin tube cannot be equal in quality to the tube which is thicker. These facts and opinions deserve careful consideration from metallurgists. Turning, now, to other causes of failure, it is found that when corrosion takes place it always occurs on the sea-water side of the tube; the steam side remains unaffected. The tubes most likely to fail are those near the top of the condenser which receive the first blow of the exhausting steam. These tubes fail either because of the destructive molecular change named, or from pitting, or because they split. Again, the tubes are all packed with tape and screwed glands, and with thin tubes—Nos. 18 or 20—it is very difficult to keep the ends tight. The tubes, it seems, will not stand up to the pressure of the packing in the tube plates, and leak. The trouble is simply to use much larger condensers, with more tube surface, and more widely-spaced and heavier tubes; in a word, condensers more like those in the mercantile marine. The rage for keeping down the size and weight of machinery in fighting ships seems likely to be followed by a reaction in favor of more generous treatment. It is, at all events, certain that the present policy of cutting down everything seriously imperils the efficiency of warships. A few tons more in the engine room would make no perceptible difference in displacement, but it would make all the difference in the world in the efficiency of the ship as a fighting unit.

Extensive additions are to be made to the plant of the Pratt & Whitney Co., Hartford, Conn. A new brick tool shop, of mill construction, will be erected. It will be four stories high and its dimensions will be 80 by 123 ft. Two of the present mills will be raised. The enlargements will cost about \$35,000.

ITEMS OF GENERAL INTEREST.

Commissioners of the port of Portland (Oregon) are having plans made for the construction of a wooden sectional floating dry dock to cost about \$185,000. The plans are being prepared by James E. Blackwell of Seattle, Wash. It is expected that bids for construction of the dock will be called for in about thirty days.

The Spedden Ship Building Co. of Baltimore has sold to the United States Marine Hospital Service the tug Neptune, built by that company in 1898. She is to be used in national quarantine service. The Neptune is of 117 tons gross register, 105 ft. long and 21½ ft. beam, with hull and house of steel. She has fore-and-aft compound engines and Scotch boiler.

Naval Constructor Lawrence Spear has submitted his resignation to the president, to take effect in May. Mr. Spear is now on duty at New York and resigns to enter a commercial business. He graduated at the head of his classes both at the naval academy and the royal school, Greenwich, England, where he took an advanced course in naval architecture.

A keel has been laid at Boole's ship yard, Oakland, Cal., for the fourth vessel to be built there for Hind, Ralph & Co. of San Francisco. The new vessel is to be of wood, a barkentine, and will have the same dimensions as the recently completed Koko Head, namely, length of keel, 215 ft.; length over all, 246 ft.; depth, 17 ft.; and beam, 41 ft. Boole & Son are expecting an order for the construction of a steam schooner of 235 ft. length.

Gustav H. Schwab of the North German Lloyd Steamship Co. was defeated for a directorship in the New York Maritime Exchange by A. B. Eldridge, a towboat proprietor. The vote cast was 157 for Mr. Schwab to 264 for Mr. Eldridge. The other officers elected were: C. B. Parsons, president; Charles R. Norman, vice-president; Louis T. Romaine, treasurer; directors, John A. Cormack, Wallace Downey, G. B. Lockhardt, Fields S. Pendleton and J. Raymond Smith.

Plans are being prepared by the navy bureau of yards and docks for the construction of one of the largest dry docks in the United States at the New York navy yard. The new dock is to be placed between dry docks Nos. 1 and 2. It will cost about \$1,000,000, and will be built entirely of concrete. When finished it will be large enough to accommodate the largest of the battleships of the navy or any the department may build in the near future. It will be 600 ft. long by 90 ft. wide at the bottom, with a clearance of 31 ft. of water over the sill. It is expected that the new dock, if there are no unforeseen delays, will be ready for use in three years.

In an interview in Washington Rear-Admiral Melville, chief of the bureau of steam engineering, said that he was gratified to learn that the opinion of the greatest living scientist—Lord Kelvin—was a confirmation of his own individual ideas as to airships and as to Santos-Dumont's in particular. Such a statement coming from Lord Kelvin must, in the admiral's view, be taken ex-cathedra, for it is that of the highest authority. The admiral said that Santos-Dumont's work was a conspicuous example of the tendency in humanity to turn to false gods and to disregard the useful—the same tendency that prefers the thing of show to that of comfort and use, the mechanical sham to the tried and true device. No branch of engineering rests on a thinner and more illogical support than that which is by courtesy called "aerial navigation." To prove that the problem of aerial navigation, though popular, is just the opposite of promising and unworthy of the interest which many people take in it, Admiral Melville recently wrote an article for the North American Review, in which he asserts that the hope for the commercial practicability of the balloon is a dream; that those who proclaim the proximate and perfect utility of the balloon or flying machine beg the question and "wrangle resolutely with the facts," and that existing physical relations, so far as can be determined by science today, give no hope for the solution of the problem, the opposite in fact, if anything. He calls attention to the fact that the steamship and automobile have grown from two historical germs, the dugout and the two-wheeled cart, but that no germ for the development of the balloon or flying machine can at present be seen. The kite is attached to the earth; the balloon and soaring machine have to obey the whim of the wind. Neither in time of peace nor war could any extended and successful use be made of the balloon or flying machine.

AROUND THE GREAT LAKES.

The Watson, one of the fruit steamers built at the Craig works, Toledo, for ocean service, has just left for the seaboard.

Capt. John Byrne, for several years master of the steamer Owego of the Union Steamboat line, died Tuesday, after an illness of two months.

Capt. William Cumming, who was appointed master of the Hanna steamer William F. Fitch, building at Detroit, has decided to remain ashore. Capt. A. J. Greenley has resigned as master of the steamer Rensselaer of the Steel Corporation fleet to take the Fitch.

The sandbar formed outside the harbor at South Chicago during the past winter, upon which the Steel Corporation steamer Frank Rockefeller grounded two weeks ago, has been surveyed and marked with a red and white buoy. The bar covers about three acres, over which the water is only about 15 ft. deep.

The branch hydrographic office at Cleveland announces that word has been received from Mr. Thomas L. Wilkins, lightkeeper of Presque Isle pier head light station, Lake Erie, that a sand bar has formed to the southward of gas buoy No. 2, and between that buoy and the east end of north channel pier. Boats should keep well to the southward of gas buoy No. 2 before turning to enter the harbor.

The New Doty Manufacturing Co., Janesville, Wis., manufacturers of punching and shearing machinery, is making a number of additions to its plant, necessitated by the increase in business. A pattern storage room, 30x70 ft., three stories high, will be built, also a new pattern shop and an extension to its machine shop of 60x70 ft. The company will also install a number of new tools.

Special harbor charts, covering all harbors of importance throughout the great lakes, have been issued within the past year by the lake survey officials. Prices are in all cases very low. The Review carries them in stock.

A BIG TRANSPORTATION PROBLEM.

Westinghouse steam turbines are to be adopted in the electric generating station to be built for the Metropolitan Railway Co. of London, the contract having just been given to the British Westinghouse Electric & Mfg. Co. of Manchester. The latter company is now filling a similar contract for the Metropolitan District Electric Traction Co., and as there will be a general similarity in the two stations, it will be easy to arrange for connecting the two and making them interchangeable, as far as the supply of current is concerned, which feature was required by the terms of the franchises of the two roads. The Metropolitan power station will be located at Neasden in the northwest of London and will contain three sets of 3,500 kilowatts capacity each. The Chelsea station of the Metropolitan District Railway will contain four sets of 5,000 kilowatts each. The electrical machinery for both stations will also be supplied by the Westinghouse company. The current will be three-phase alternating and of 10,000 volts, to be transformed in sub-stations to direct current for use in the car motors.

It will be remembered that the matter of equipping the Metropolitan road electrically was the cause of a long and hard-fought battle before a court of arbitration between the Ganz polyphase and the American direct-current systems of working, the American system, which finally triumphed, being espoused by the District Railway under the leadership of Mr. Charles T. Yerkes. The steam for the immense steam turbines in the District and Metropolitan plants will be generated in water-tube boilers. The aggregate power of the two plants will be 30,500 kilowatts. It is hoped that in a year and a half the equipment will be complete and in working order. Both roads are underground and the change to electric traction will be an important and desirable step in the solution of London's transportation problem.

The first cement plant in Canada to be operated by electric power is that of the National Portland Cement Co. at Durham, Ont. All of the cement-making machinery in this plant will be driven by induction motors supplied with current by two Westinghouse 450 K.W., three-phase alternators. These machines are of the engine type with revolving fields and run at 125 revolutions per minute, 3,000 alternations and 600 volts. Two exciting units are provided, one consisting of 62½ K. W., 125 volt, engine-type, D. C. generator, direct connected to an automatic engine, and the other of a 56½ K. W. machine coupled to an induction motor. The output of the exciters will be used not only for exciting the fields of the A. C. generators, but also for arc and incandescent lighting throughout the works and grounds. The Westinghouse company also furnishes the eight-panel switchboard and instruments.

CANALS TO COST ONE HUNDRED AND FIFTY MILLIONS.

Mr. Carl B. Hurst, United States consul general at Vienna, makes a special report regarding a measure for a new system of canals, which has just been adopted in Austria. "This undertaking will do more," he says, "than anything yet enacted in Austria to promote the commerce of the country. It will not only bring the various provinces into closer touch, but will also afford the cheapest freight connections with Germany and Russia."

The measure provides, first, for a canal from the Danube to the Oder; second, for a canal from the Danube to the Moldau, near Budweis; third, for a canal from the Danube-Oder canal to the upper Elbe, and fourth, for a canal from the Danube-Oder canal to the Vistula and to some navigable portion of the Dniester. There will be about 1,000 miles of navigable waterways, which will be constructed by the state with co-operation of the provinces, districts and towns, and especially of Vienna and Prague. The contributions of the municipalities and provincial authorities can be made either by single payment or in annual instalments, or through the erection of certain works, such as harbors, docks or streets leading to them, or through the cession of land or water rights. The work of construction will begin at the latest during 1904, and the entire system will be finished within twenty years. The cost of construction, in so far as it will not be covered by contributions, is to be met by an issue of 4 per cent. tax free government bonds, redeemable within ninety years. The government is empowered to issue these bonds to an amount not exceeding \$50,750,000 during the period of construction, from the year 1904 to 1912, and the money thus raised shall be used only in building the designated waterways. For the expense after 1912 due provision will be made by law. The entire cost of construction is estimated at \$152,150,000, and the canals will be designed to admit boats up to 600 tons burden.

AMMUNITION EXPENDED IN BATTLE.

Rear-Admiral Charles O'Neil, chief of the bureau of ordnance, navy department, recently prepared some interesting figures on the subject of ammunition expended in the battles of Manila and Santiago. In the fight at Manila the United States ships expended 132 tons of ammunition, including powder; the cost was \$50,044. Nearly 67 tons of metal were thrown in 5,858 discharges. Of these, 1,413 rounds were fired by the main batteries of the fleet and 4,445 by the secondary batteries. The ammunition expended in destroying the Spanish fleet off Santiago amounted to 164.7 tons; the projectiles thrown weighed 114.3 tons. Thirteen hundred rounds were fired from the main batteries, 8,174 from the secondary, a total of 9,474 rounds. Of this number only 124, or 1.3 per cent., are known to have hit their marks. The Oquendo was struck sixty-one times, the Viscaya twenty-eight times, the Maria Teresa twenty-nine times, and the Colon six times. Recent target practice in the British navy has developed a very much greater percentage of hits, yet in that practice the targets were stationary, and the vessels firing were moving at a fixed speed. In the battle off Santiago, however, the targets were moving as rapidly as they could and the pursuing vessels following at constantly increasing speed. As the figures stand, the cost of ammunition to the United States in defeating Spain at sea was only about \$175,000, of which \$134,909.11 was spent in the two decisive battles of Manila and Santiago.

Hard coal shipments from Buffalo during April aggregated 164,650 tons. This is just a straw showing what an early opening of navigation means. In some seasons Buffalo shipments of hard coal during April would amount to practically nothing.

A Splendid Book and a Timely One

MODERN SEAMANSHIP

Lt. Comd'r Austen M. Knight.

Is the title of a book recently written by Lieut. Comd'r Austen M. Knight, executive officer of the cruiser Olympia. The title of the volume could not be more appropriate. Seamanship is as old as the deluge. From century to century, through the connecting link of generations, seamanship has been handed down to us. Until as late as forty years ago seamanship was the supreme art of the sea.

But changes, wonderful to contemplate, have marked the last half century. The name of the great revolution was steam. Through its agency seamanship lost its old command. It became subordinate to the science of navigation. All existing volumes upon seamanship speedily became obsolete. But yesterday of unquestioned authority, today they are merely junk. Such is the moving panorama of the world's progress that its views appear, like opportunity, but once upon the scene and are gone. How appropriate, therefore, is its title "Modern Seamanship." It has to do with seamanship as it exists today, when every sea is charted, when even the rise and fall of the tides in every part of the world is computed by machinery, when hurricanes can hurl their awful force against the ocean liner—not to destroy but merely to check. "The hurricane reached its maximum at twelve and the Kronprinz Wilhelm checked down"—the dispatches will say. Checked down to what? To 19 knots. Twenty-five years ago there wasn't a steamship afloat that could make 19 knots in the smoothest sea that ever was sailed. This is the seamanship the book deals with. It embraces all, the old and the new, but its great virtue is that it is distinctly modern.

We are in the business of handling books, but when the printer sent us this product of his handiwork, we complimented him. It is a large book but it is superb to the least detail of its 428 pages, to which must be added 136 of the finest and clearest plates we have ever seen. No book has received more favorable notices. Even the daily press, usually as dumb as oysters when a technical volume appears, have devoted columns to it. It has been adopted as a text book at the United States Naval Academy. We should think that every person interested in modern seamanship, in the science of navigation, in the building, equipping and managing of a ship would want it. We shall be glad to send it to anyone. THE PRICE IS \$6.

THE MARINE REVIEW PUBLISHING CO.,

39-41 WADE BUILDING,

CLEVELAND, O.

TRADE NOTES.

Among recent orders for ship yard machinery booked by the Atlantic Works Incorporated of Philadelphia is one from the United States government for two 10-in. deck planing machines, to be used at the League Island navy yard.

At the annual meeting of the Seaboard Steel Casting Co. at Chester, Pa., recently, the following were chosen directors: Joseph Wharton, Isaac H. Clothier, Morris L. Clothier, William C. Sproul, John B. Roach, Thomas H. Savery, and J. H. Cochran. The old officers were re-elected.

At the annual meeting of the Joseph Dixon Crucible Co. of Jersey City the old board of directors was re-elected, and in turn re-elected the following officers: President, E. F. C. Young; vice-president and treasurer, John A. Walker; secretary, George E. Long; executive committee, John A. Walker, Joseph D. Bedle and William Murray. The company has a surplus of \$1,300,000, with outstanding debts of only \$7,000.

A very neat booklet, one that is much above the ordinary, has just been issued by the Niles-Bement-Pond Co. of New York, the great machine tool concern. The booklet is intended for distribution at the Crystal Palace exposition in England. It describes and illustrates a few of the standard types of American machine tools built at the various works of the Niles-Bement-Pond Co. The output of this company comprises every form of metal-working machine tool used in the equipment of machine shops, large or small.

COMPAGNIE GÉNÉRALE TRANSATLANTIQUE

FRENCH LINE—UNITED STATES AND EUROPEAN MAIL ROUTE.

New York to Havre-Paris in less than one week.

Steamers sail from New York every Thursday, at 10 a. m.

Company's own vestibuled train from Havre to Paris in four hours.

FLEET 70 STEAMERS.

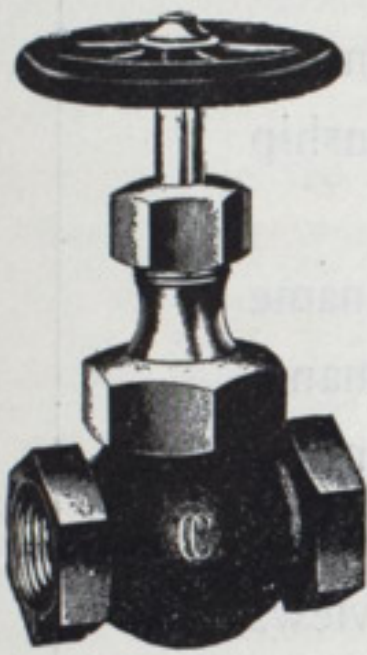
In New York service the following gigantic Twin Screw Steamers:

"LA LORRAINE" (new)	Twin Screw	15,000 tons	22,000 H.P.
"LA SAVOIE" (new)	"	15,000 "	22,000 "
"LA TOURAINE" (modern)	"	10,000 "	12,000 "
"L'AQUITAINE" (modern)	"	10,000 "	16,000 "

Naval officers command above steamers, insuring the same strict discipline as on a man-of-war. These ships all have double bottoms and water-tight compartments, and prescribed routes are taken to avoid fogs. The above steamers contain every modern twentieth century equipment for safety, most luxurious accommodations, and the cuisine is famous. The favorite route of the elite of both continents. For rates, plans and other particulars apply to

EUGENE DE BOCANDE, General Agent for United States and Canada, 32 Broadway, New York.

MAURICE W. KOZMINSKI, General Western Agent, 71 Dearborn St., CHICAGO, OR TO LOCAL AGENTS.



No. 70.

CRANE NAVY VALVES

UNION BONNET

GLOBE, ANGLE, CROSS, AND CHECK

REGRINDING

FOR 175 LBS. STEAM PRESSURE TESTED TO 250 LBS. HYDRAULIC. CAN BE REGROUND WITHOUT DETACHING FROM PIPE. CAN BE PACKED WHEN VALVE IS OPEN. ARE EXTENSIVELY USED ON STEAM VESSELS WHERE A PERFECTLY RELIABLE VALVE IS REQUIRED.

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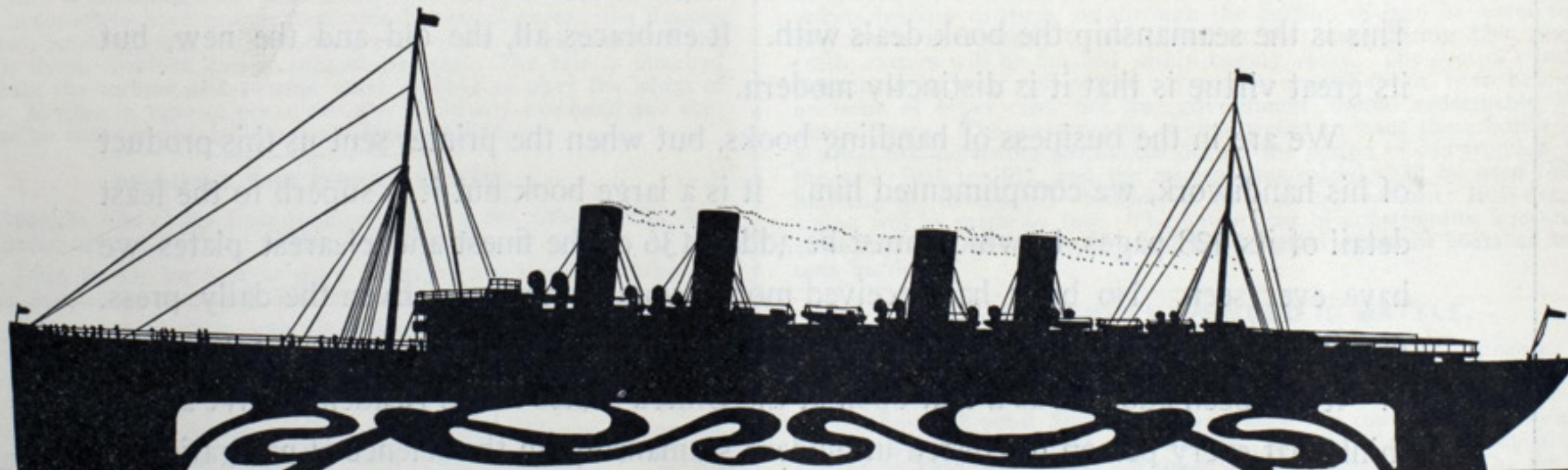
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"BENEDICT-NICKEL"

Seamless Condenser Tubes

are highly non-corrosive and are not readily affected by Electrolysis.

Actual tests have demonstrated that they last under conditions where tinned brass tubes are very soon destroyed.

Our treatise, "Electrolysis of Condenser Tubes," gives the full scientific reason for the superiority of "Benedict-Nickel" over copper and brass—send for it.

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GAS BUOYS ON THE PACIFIC.

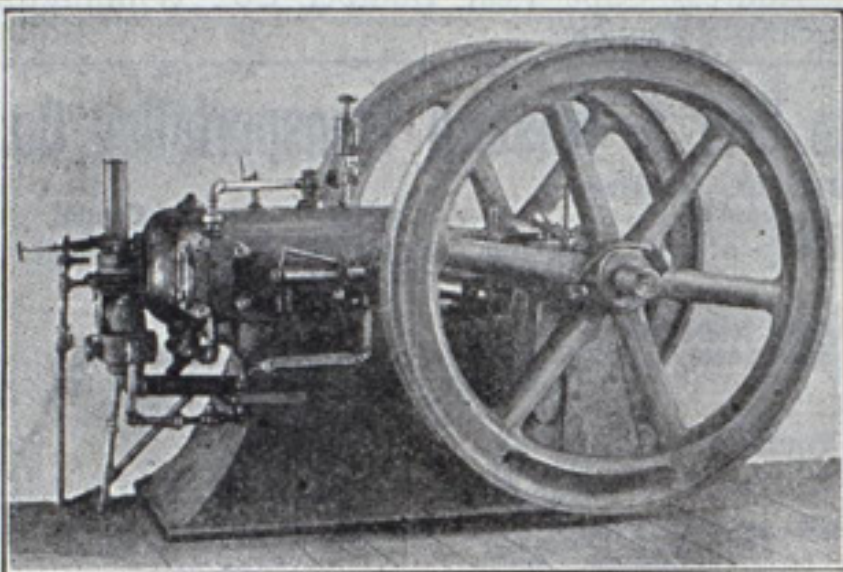
It was reported the other day that the lighthouse tender Manzanita was about to place a Pintsch gas buoy on the bar at the mouth of the Columbia river, Oregon. This was claimed to be the first gas buoy put down on the Pacific coast. This is a mistake, however, as there is another at San Francisco which was ordered by the lighthouse department to take the place of the lightship when it was necessary for her to leave her station off the harbor of San Francisco. It is surprising how far behind the Pacific coast is in the proper illumination of its harbors by this valuable device. There are at the present time about seventy-five of these buoys on the great lakes and eighty or more along the Atlantic and Gulf coasts, where they are of inestimable value, and in referring to them the best pilots say that they don't see how they ever got along without them. Since their introduction the stranding of vessels in intricate channels at night has become less and less each year, owing to their making the channel perfectly plain for the navigator and their unquestionable reliability—Marine Journal.

It is reported that the syndicate which has underwritten the new steamship combination is identical with that which underwrote the United States Steel Corporation.

SMOOTH-ON IRON CEMENTS

We have many
like the
following:

April 26, 1901.
To Whom It May
Concern:
We have used Smooth-On Iron Cement for leaks and fractures on Water Jackets of Gas Engines with satisfactory results. We find it an economical way of making a durable repair.
Hudson County Gas Co.
P. S. Young, Secretary.



The Smooth-On Iron and Steel Cements are dry metallic compositions—which, when mixed with water, become a hard metallic iron that is insoluble in Steam, Water, Petroleum or other oils—that will withstand an intense heat, and, the expansion and contraction being the same as iron, is why they are sometimes called Magic Iron. When applied to a blemish in a casting by a skilled mechanic the blemish is removed. Unequalled for boiler patching and stopping blowholes in iron or steel castings; when metalized, Smooth-On is the color of cast iron and as hard. Write for our 60-page illustrated book telling all about the different Smooth-On Cements; it is free.

Sole Proprietors and Manufacturers,

SMOOTH-ON MFG. CO.

547 551 COMMUNIPAW AVE.

JERSEY CITY N. J. U. S. A.

VREELAND TOMPKINS—CHEMIST AND GEN. MANAGER

Cabins and ..Staterooms

of modern vessels especially those in the passenger service should demonstrate the supreme possibilities of the wood finisher's art.

This demands a special varnish however, as atmospheric conditions are more destructive to varnish afloat than ashore and the ordinary article is of but little use.

The varnish best adapted to withstand the deleterious influences of wind, wave and weather is "BERRY BROTHERS' SPAR VARNISH."

Further particulars and a unique marine puzzle sent free for the asking. Write us.

Berry Brothers, Limited

Varnish Manufacturers

NEW YORK BOSTON PHILADELPHIA
BALTIMORE CHICAGO
CINCINNATI ST. LOUIS SAN FRANCISCO

Factory and Main Office, DETROIT

"Seaboard Steel Castings."

MANUFACTURERS OF
"THE ADMIRAL" ANCHOR.

THE LATEST AND BEST
STOCKLESS ANCHOR.
APPROVED BY LLOYD'S.

ANCHORS CAST AND TESTED ON
ORDER, OR STOCK ORDERS
PROMPTLY FILLED.

A GUARANTEE OF QUALITY.

OPEN-HEARTH STEEL CASTINGS
OF THE HIGHEST GRADE.
FACILITIES FOR CASTINGS UP TO
80,000 POUNDS WEIGHT.

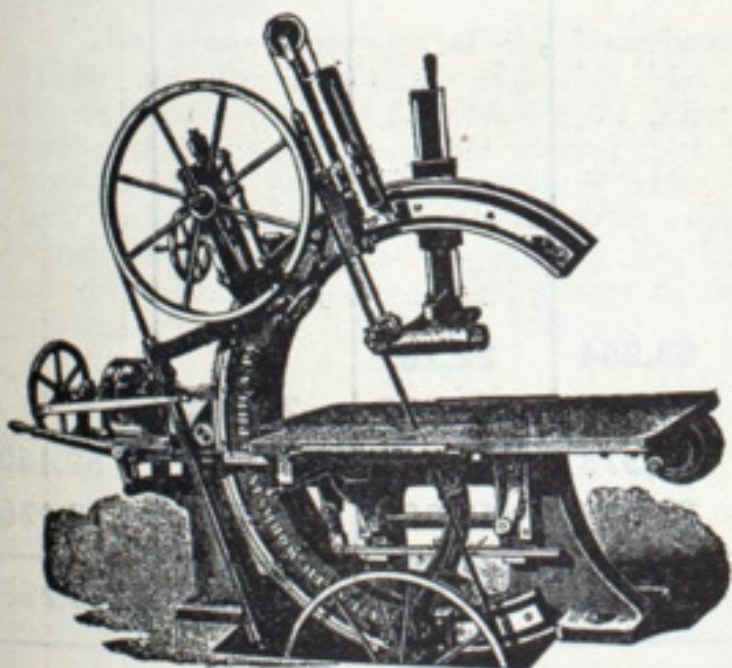
MACHINE WORK AND PATTERNS
FURNISHED WHEN REQUIRED.

RAIL OR WATER DELIVERIES.

CAPACITY, 1500 TONS PER MONTH

Seaboard Steel Casting Co.,

CHESTER, PA.



ADJUSTABLE BEVEL BAND SAW.

Will bevel both ways to 45 degrees.
Power movement to change angles.
Power feed in three directions.

ESTABLISHED 1869.

INCORPORATED 1896.

ATLANTIC WORKS INCORPORATED,

Successors to Berry & Orton Company.

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MANUFACTURERS OF

MACHINERY FOR WORKING WOOD

FOR USE IN SHIP YARDS,
CAR SHOPS, RAILROAD SHOPS.

SEND FOR CATALOGUE.

ESTIMATES FURNISHED.

Hollow Chisel Mortisers.

Car Sill Dressers.

"PRESERVO" WILL NOT CRACK, SCALE, FREEZE OR STICK—SEE PAGE 8.

OFFICERS OF DAVIDSON SHIPS.

Captains and engineers of the vessels of James Davidson of West Bay City, Mich., are: Steamers—Shenandoah, Capt. Geo. C. Burns, Engineer Geo. M. Wise; Orinoco, Capt. Chas. Ainsworth, Engineer W. J. Downing; Amazonas, Capt. E. Smades, Engineer J. A. Southgate; Cartagena, Capt. W. L. Montgomery, Engineer Harry E. L'Hote; Venezuela, Capt. Walter M. Mahon, Engineer Geo. W. Marshall; Nicaragua, Capt. Wm. G. Maltby, Engineer Ed R. Dungan; Bermuda, Capt. H. J. Hagan, Engineer Ed Taubert. Schooners—Granada, Capt. Geo. Williams; Paisley, Capt. Lawrence Coleman; Grampian, Capt. A. Gustafson. Officers of the Davidson vessels chartered to the Algoma Central Steamship Co. are: Steamers—Rappahannock, Capt. John L. Bradshaw, Engineer E. W. Tilley; Sacramento, Capt. Harry Gunderson, Engineer A. G. Olmsted. Schooners—Pretoria, Capt. E. J. Starkey; Matanzas, Capt. Martin Johnson.

NEW YORK VIA WASHINGTON, D. C.

At ticket offices of the Pennsylvania Lines tickets to New York via Washington, D. C., may be secured at same first-class rate that applies via the direct line.

Tickets via Washington are good for stop at Baltimore, Washington and Philadelphia, ten days at each point being allowed.

For rates, time of trains, etc., apply to nearest ticket agent, or address C. L. Kimball, Ass't. Gen'l. Pass. Agent, Cleveland, O.

Some interesting reading matter relative to very shallow draft powerful steamboats for river navigation is mailed free on receipt of request by Marine Iron Works, station A, Chicago.

Treasury Department, Office of General Superintendent U. S. Life-Saving Service, Washington, D. C., April 26, 1902. Sealed proposals will be received at this office until 2 o'clock p. m. of Monday, the 26th day of May, 1902, and then publicly opened, for furnishing supplies required for use of the Life-Saving Service for the fiscal year ending June 30, 1903; the supplies to be delivered at such points in New York City, Grand Haven, Mich., and San Francisco, Cal., as may be required, and in the quantities named in the specifications. The supplies needed consist of Beds and Bedding; Blocks and Sheaves; Cordage; Crockery; Furniture; Hardware; Lamps, Lanterns, etc.; Medicines, etc.; Paints, Oils, etc.; Ship Chandlery; Stoves, etc.; Tools and Miscellaneous Articles; all of which are enumerated in the specifications attached to the form of bid, etc., which may be obtained upon application to this office, or to the Inspector of Life-Saving Stations, 17 State St., New York City; Superintendent Twelfth Life-Saving District, Grand Haven, Mich.; and Superintendent Thirteenth Life-Saving District, New Appraisers' Stores, San Francisco, Cal. Envelopes containing proposals should

be addressed to the "General Superintendent U. S. Life-Saving Service, Washington, D. C." and marked on the outside "Proposal for Annual Supplies." The right is reserved to reject any or all bids, and to waive defects, if deemed for the interests of the Government.
S. I. KIMBALL,
General Superintendent.
May 8.

U. S. ENGINEER OFFICE, Jones Building, Detroit, Mich., April 19, 1902. Sealed proposals for dredging, and other work required for removing obstructions to navigation in main Ship Channel, between Sault Ste. Marie, Mich., and Lake Huron, will be received here until 12 noon (Standard time), May 19, 1902, and then publicly opened. Information furnished on application. W. H. BIXBY, Major, Engrs.
May 15

Compound Marine Engine for sale.

One fore-and-aft compound marine engine. Cylinders 16 and 32x30. In good condition; practically new. Will be sold cheap.

RIVER MACHINE & BOILER Co.,

May 1.

108 to 114 River st., Cleveland, O.

Boat Wanted for Lumber Trade.

WANTED—By a concern on the Atlantic coast about 500 miles south of New York, a good responsible shipping firm who can furnish an A1 boat to carry lumber by the thousand to New York and Boston. The mill to guarantee prompt loading and unloading, and work the entire year round. Would make regular charter with these guarantees specified. Would want boat to carry about one million feet at a load. Please give name of boat you furnish, with all particulars. Also rate she will insure at. Address Cape Fear Lumber Co., Wilmington, N. C. Reference—Mercantile agencies.
May 29.

The Erie & Western Transportation Co. ANCHOR LINE. 1902.

Passenger Service—

Steamers.....	India,	China,	Japan.
Ports of call...	Buffalo, Sault Ste. Marie, Hancock, Marquette, Cleveland, Duluth, Houghton.		
	Detroit, Mackinac Island, Erie,		

Freight Service—

Steamers.....	Alaska, Delaware, Codorus, Mahoning, Susquehanna, Schuykill, Lycoming, Conestoga, Clarion, Wissahickon.
	Conemaugh, Juniata, Lehigh,

Ports of call...	Buffalo, Erie, Cleveland, Marquette, Duluth, Milwaukee.
	Detroit, W. Superior, Hancock, Chicago,
	Houghton, Sault Ste. Marie,

CHAS. E. MARKHAN, Gen. Pass. Agt., Buffalo, N. Y.

E. T. EVANS, Western Manager, Buffalo, N. Y.

BELLEVILLE GENERATORS

Grand Prix 1889

Originated 1849

Hors Concours 1900

Latest Patents 1902

Number of Nautical Miles made each year by Steamships of the Messageries Maritimes Co., Provided with Belleville Generators—Since their Adoption in the Service.

Year.	Australien	Polynésien	Armand Béhic	Ville de la Ciotat	Ernest Simons	Chili	Cordillère	Laos	Indus	Tonkin	Annam	Atlantique
1890.....	67,728	2,460										
1891.....	68,247	68,331	204									
1892.....	68,247	68,403	69,822	23,259								
1893.....	68,379	68,343	68,286	68,247								
1894.....	68,439	68,367	68,574	68,439	37,701							
1895.....	68,673	68,766	68,739	68,808	40,887	28,713						
1896.....	69,534	92,718	69,696	69,549	62,205	63,153	40,716					
1897.....	68,250	69,606	92,736	69,555	62,235	76,110	63,357	43,146				
1898.....	70,938	69,534	69,552	69,597	62,526	63,240	63,240	62,553	63,954	22,707		
1899.....	69,534	69,615	67,431	90,405	60,246	62,778	62,868	52,344	54,855	44,007	22,884	
1900.....	69,534	67,494	69,744	69,564	61,719	62,382	62,502	51,471	53,373	62,016	63,066	52,140
1901.....	44,220	69,627	69,594	66,948	51,057	62,460	62,490	61,743	62,688	43,866	62,466	63,126
Total.....	801,723	783,264	714,378	664,371	438,576	418,836	355,173	271,257	234,870	172,596	148,416	115,266

ATELIERS ET CHANTIERS DE L'ERMITAGE, À ST. DENIS (SEINE), FRANCE.

WORKS AND YARDS OF L'ERMITAGE AT ST. DENIS (SEINE), FRANCE.

TELEGRAPHIC ADDRESS: BELLEVILLE, SAINT-DENIS-SUR-SEINE.